SUBSISTENCE AND COMMERCIAL FISHERIES THROUGH THE LENSES OF CULTURE AND ECONOMY IN THREE COASTAL ALASKAN COMMUNITIES

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ABSTRACT

Commercial and subsistence fisheries in Alaska are complex social-ecological systems constituting interdependent components which include economics and culture at the local and regional levels. Each fishery has unique challenges and benefits; however, a commonality that can be found in coastal communities in Alaska is that salmon fisheries are for many a way of life that serve to link commercial and subsistence practices to family and traditions. This research investigated whether and how culture is a key component of subsistence and commercial fisheries in three core study communities in different parts of coastal Alaska; Chenega Bay in Prince William Sound, Kokhanok in Bristol Bay, and Tyonek in Cook Inlet, and includes summary research findings from 12 comparative communities on the south side of the Alaska Peninsula, Kodiak Island, and Southeast Alaska. The research sought to understand 1) how people in different areas of Alaska articulate the role of subsistence fisheries in their communities, 2) what factors are impacting participation in commercial fisheries, and 3) what methods could be used to assess the resilience and vulnerability of such diverse coastal communities in Alaska.

Among the factors investigated in each community were the role of local level politics and how local knowledge is passed down through participation in subsistence salmon fishing activities. To examine methodologies for assessing community vulnerability and resilience within a larger system, quantitative data gathered through household surveys was used to provide a basic statistical assessment of the economic and subsistence landscape of coastal communities in Alaska. But it was through in-depth semi-structured interviews, during which residents shared their own personal stories, that a broader, more accurate assessment of resilience and the complexity of community-based fisheries was achieved. During household harvest surveys administered in the core study and comparative communities, as well as through in-depth interviews conducted in the three core communities, residents articulated how participating in salmon fishing is an expression of a subsistence way of life and of cultural traditions. Commercial fishing as a way of life is also something they seek to pass on to their children. In all of the study communities, residents noted that the reasons they continue to live in their rural coastal communities include family, culture, home, a subsistence lifestyle, and a sense of freedom.

Challenges to maintaining continuity in the commercial fishery, and to passing on this lifestyle to their children, include the price effects of the globalization of salmon markets, market access to sell one's fish, and financial difficulties of entering a capital-intensive fishery. However, there are and have been efforts in each of the three communities to revitalize participation in commercial fishing. Residents of these fishery dependent communities have a strong connection to salmon as an economically valuable resource through commercial fishing, and to salmon as a cultural and place-based resource by participating in subsistence salmon fishing.

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Chapter 1 – INTRODUCTION

Fisheries in Alaska are intertwined within complex social-ecological systems exhibiting an interdependence between economics, subsistence, and culture. Fishery dependent communities are settings where commercial and subsistence practices invoke notions of family, traditions, and a sense of place. While attending an Alaska Board of Fisheries meeting in Anchorage in 2009, I began to think about how salmon fisheries were intertwined in the lives of people that live in small coastal communities in Alaska. The focus of the meeting was the Bristol Bay region of Southwest Alaska, which is home to the most abundant salmon fishery in the world. I had worked in Bristol Bay for several years on various projects beginning in 2002 and had conducted social science research in just about every community in Bristol Bay over that time, sometimes traveling to the same community several times a year. In Alaska, Bristol Bay has some of the most abundant Chinook[1] (*Oncorhynchus tshawytscha*) and coho (*Oncorhynchus kisutch*) salmon runs, prized fish for sport, commercial, and subsistence harvest. In most Bristol Bay subsistence fisheries there are no harvest limits; residents harvest what they need and are only limited by their ability to process salmon. Bristol Bay also has the world's most abundant run of sockeye salmon (*Oncorhynchus nerka*), the Kvichak River sockeye, providing millions of salmon to communities along the Kvichak River and Iliamna Lake to harvest for subsistence, as well as to the commercial fishery of Bristol Bay.

Throughout the meeting, I listened to public testimony by area residents and fishers about how they were having a hard time making a living. I had collected economic data in Bristol Bay communities and

[1] Chinook is capitalized throughout while other species in the Pacific salmon genus are not capitalized. The word Chinook is commonly capitalized as it is also the name of the indigenous inhabitants of the lower Columbia River, where this species is abundant (Silverstein 1990:533).

knew that household incomes were low compared to urban Alaska, but there was a strong commercial fishing economy with active participation by residents of every community in Bristol Bay (Holen 2011). For over a hundred years commercial fishing has been and continues to be a key feature of the economy and culture of the Bristol Bay region. Communities like Dillingham and Naknek have boatyards where hundreds of fishing boats are stored through the winter when not in use in the fishery. In communities like Iliamna, far up the Kvichak River, fishing boats line the edge of the lake, traveling downstream each summer to be used in the Bristol Bay fishery. What I was hearing at that meeting was in an area rich in fish, fishing history, and fishing culture, residents were having a hard time making a living. Working for the Alaska Department of Fish and Game, Division of Subsistence (ADF&G) over several projects, we had done considerable research into how residents harvest the abundant salmon runs in the subsistence and sport fisheries of Bristol Bay to feed their families. But rural Alaska is a mixed economy and people need to work as well as fish to make ends meet. I realized at that meeting I wanted to better understand the intersection of the commercial fishing economy and subsistence economy, necessary to maintain community resilience not just in Bristol Bay, but also in other coastal communities in Alaska.

Alaska has become a key case study of the viability of fishing communities in the United States. It is an example of where fisheries policy seeks to sustain community participation in fisheries and the uniqueness of fishing communities (Olson 2005:256). Fisheries are central to community sustainability and "vital to the local economy," especially in Alaska (Himes-Cornell and Kasperski 2016:1). Participation in any fishery in Alaska provides an individual not only with access to food, but is an activity that involves families working together and maintaining strong relationships within their communities. Participation in fishing, both through subsistence and commercial activities, produces a unique set of

values. This dissertation will explore how community members value fishing and what role these values play in the vitality of rural Alaskan fishing culture, or fishery dependent communities.

Along the coast of Southeast, Southcentral, and Southwest Alaska there are numerous small communities that are dependent on fishing. Fishing communities are defined as communities where fisheries meet social and economic needs (Himes-Cornell, et al. 2016; MSFCMA 2007). For the purpose of this study, fishery dependent communities are defined as communities where fisheries provide a significant component of the economy in terms of jobs and income, as well as food security through both the harvest of fish through subsistence and removal of fish from commercial harvests for home use. But in addition to this fishing, both commercial and subsistence, is a way of life deeply rooted in family, culture, and tradition.

To understand the broader context of what constitutes a fishery dependent community in Alaska my research focused on three rural fishing communities in different parts of coastal Alaska in an effort to examine the economic and cultural viability surrounding commercial and subsistence fishing. I wanted to compare communities to determine whether there are consistent themes across fishery dependent communities. Since 2000, I have conducted research in rural communities throughout Alaska from the high arctic to Southeast Alaska for ADF&G, documenting the importance of fisheries, in terms of both nutritional value through the harvest of fish for subsistence, and participation in the commercial fishing economy which provides jobs for rural Alaska residents. Trying to look past the obvious benefits of economy and food security, I want to understand how fisheries are both a part of culture and how residents articulate fisheries *as* culture. I observed, especially in Bristol Bay and Cook Inlet, how fishing brings extended families together in order to ensure the success of the harvest, process fish, and distribute the resource for the benefit of the larger family and community. People often tell me that

they cannot explain why they fish each year; they feel a sense of loss if they do not fish. Fishing is a part of their identity that strengthens the bonds of family and community.

Having conducted research in communities across southern coastal Alaska from Bristol Bay to Southeast Alaska, I chose three communities for this project carefully. The study communities are Kokhanok located in the Bristol Bay watershed, Chenega Bay located in Prince William Sound, and Tyonek located in Cook Inlet (Figure 1-1). Each community is located in a different watershed and has a unique commercial fishery management structure, and each community has a long-documented history of both commercial and subsistence fishing. All three communities have active village governments and long established schools, which are a central feature of social activity in rural Alaskan communities. Demographic studies from past household surveys conducted by ADF&G, showed a diverse population in terms of age structure with many school-aged children (see Fall, et al. 2006a; Krieg, et al. 2009; Stanek, et al. 2007, for each community respectively). In addition to these three core study communities, I continued some of the questions in communities in other parts of Alaska through ADF&G surveys to create a comparative database of other fishery dependent communities. This included surveys that were conducted in the Alaska Peninsula communities of Chignik Bay, Chignik Lake, Chignik Lagoon, and Perryville for the 2011 study year, the Kodiak Island communities of Kodiak City, Larsen Bay, and Old Harbor and Southeast Alaska communities of Angoon, Haines, Hoonah, Hydaburg, and Whale Pass for the 2012 study year.

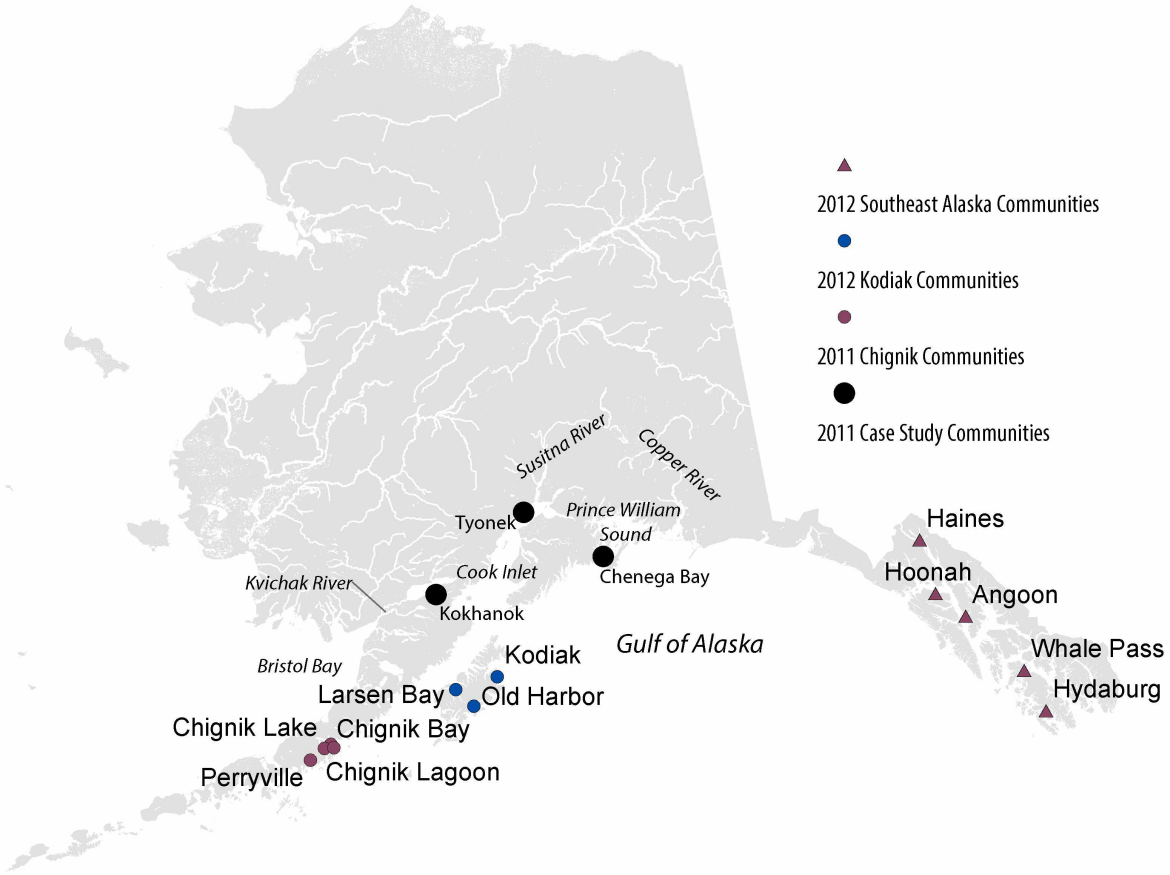

Figure 1-1. Study Communities

Fishery Dependent Communities

This research investigates the dependency of residents of Kokhanok, Chenega Bay, and Tyonek on fisheries for community well-being and long-term viability. Fishing as an activity takes on new meanings in many rural communities throughout the North when residents become involved in commercial fishing. In the distant past, residents of the North, viewed salmon as kin who gave themselves to the fisher (Lansing, et al. 1998). Fishers then treated the salmon with respect, returning their bones and other body parts to the water so that they could return again. For example, in Bristol Bay where the

community of Kokhanok is located, salmon parts discarded during processing are returned to the waters to maintain the continuity of the cycle (Fall, et al. 2010). With the introduction of commercial fishing in the early 20th century, which was often controlled by far off Seattle based cannery companies, this human-salmon relationship changed from one once based solely on subsistence and kinship to one also based on monetary value (Peterson 1983:78)[2]. Researchers have investigated this shift and how it affects culture and identity in the North as well as other parts of the world such as Brittany, France (Menzies 1997), the Northwest Coast of North America (Boxberger 1989), and others (Callon 1986; Langdon 1989; Lansing et al. 1998).

This research investigates the dependency of rural communities in Alaska on fisheries, especially salmon fisheries, by investigating how commercial and subsistence fisheries create and maintain culture and community. In this case, community extends past physical boundaries and incorporates actors within a

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[2] This research project focuses on contemporary salmon fisheries and the recent events that respondents indicated as factors affecting their fisheries. However, there is a long history of commodification of fisheries dating back to the early American period in Southcentral Alaska, the area where the three core study communities are located. The first cannery to open in Bristol Bay was established on the east bank of the Nushagak River at Kanulik. It was opened in 1882 by the Arctic Packing Company (Unrau 1994:144). Over the next 20 years, 10 more canneries were opened in Nushagak Bay employing mainly Chinese labor, but eventually local-residents worked in the canneries regardless of considerable prejudice (VanStone 1971:22). Fishing boats were mainly owned by non-resident fishers and even in 1929 there were only 28 resident boats in all of Bristol Bay (VanStone 1967:78). It wasn't until World War II when non-resident fishers left to join the war effort that residents were able to gain a foothold in the fishery, which they were able to maintain following the end of World War II (Peterson 1983:72). In Cook Inlet the first commercial salmon fishery began on the Kenai River in 1878, operated by the Alaska Commercial Company (ACC) (DeArmond 1969:1). Early fishers used dip nets, traps, and weirs with the fish salted in barrels for transport. Cannery employed fishers fished at Tyonek and other west Cook Inlet locations, and even purchased salmon from the Dena'ina. These sales and commercial harvests created shortages of subsistence salmon for the Dena'ina and displaced them from their traditional fishing sites at locations like Ladd, near contemporary Tyonek. The journals of the ACC agents at Tyonek in the 1880s and 1890s contain reports of hunger among the Tyonek Dena'ina that they attributed to sale of salmon to cannery ships and reduced runs of fish (Fall 1987:28). For a more in-depth review of the history of commercial fishing in Cook Inlet see Ringsmuth (2005) and Stanek, Fall, and Holen (2006). For a more in-depth history of the early commercial fishery in Bristol Bay see Branson (2007) as well as other writings by this historian on the history of Bristol Bay.

social network with a central interest in ensuring the continuity of both the subsistence and commercial fisheries in their region. Community becomes a mosaic of social, political, and economic relations (Schroeder 2003:450). The intersection of fisheries and the human actors that participate in these fisheries occurs within a bounded social-ecological system, a system that intertwines the lives of salmon and people.

There are many contemporary internal and external factors that create long-term viability of rural fishing communities in Alaska. To understand long-term viability of rural fishing communities, this project focused on internal cultural factors such as family, community, and a subsistence way of life, as well as the local-level politics and the broader external economics that shape contemporary commercial and subsistence fisheries in Alaska. It also considers the local mixed economy that enables families to ensure adequate food security. Subsistence harvests, especially of salmon, are important for rural communities in this region of Alaska. Thus, salmon as a resource has become a symbol of the reliance on subsistence for many rural communities in subarctic Alaska situated along river and coastal marine environments as they comprise the largest component of the overall wild harvest (Holen and Fall 2011). Individuals within communities reify salmon as integral to the construction and maintenance of subsistence identities and, in so doing, the collectivity of individuals solidifies the structure of the society itself (Leach 1954:8). Salmon fishing is a social activity that involves entire households, extended families, and communities working together. Lastly, salmon above any other fish in Alaska, has become an almost anthropomorphized species, brilliant in color, abundant across Alaska, binding communities and landscapes together, and common in myth and legend among coastal peoples along the Northwest Coast of North America. Today salmon continues to be a symbolic species important to sport,

commercial, and subsistence users in almost every part of Alaska except the Arctic, available across the Pacific Ocean from Japan to the West Coast of the United States (Lien 2012).

SALMON, SUBSISTENCE, AND ECONOMICS

In all three study communities, Chenega Bay, Kokhanok, and Tyonek, residents are predominately indigenous to the area and spend a great deal of effort engaged in subsistence fishing, especially for salmon. Salmon fishing in Alaska's indigenous subarctic coastal communities has been a fundamental component of the local economy and culture since time immemorial.

> Long ago there were no fish and everyone was hungry. Raven said, "I'll fix it," so he drifted with the tide until he caught a trout. Soon many herring began to run and he caught them. He rubbed them all over his boat so that blood and entrails were everywhere. Then he went back to his people and told them he was tired of fishing and had caught nothing. The people looked in his boat and saw all the blood and entrails and knew that he had been joking. Soon the salmon started to run and went all over the village, breaking through the doors of the houses, and filling the caches. Since then the salmon have run every year (Osgood 1937:184).

Cornelius Osgood's retelling of the story by Eklutna Jim shows the importance of salmon to the culture and economy of the Dena'ina of Cook Inlet. In March 2002, while conducting fieldwork in Nondalton, an inland Dena'ina community, I learned just how central the salmon run was to the community. The salmon that previous summer had come by the community quickly before anyone could get their nets in the water to harvest them. Because of this, the caches in the community were empty. The one village store had empty shelves and freezers. To counter the absence of salmon, which are so essential to the food security needs of the community, two men spent the entire winter hunting moose. Residents turned off their heat to save money and spent much of their time collecting firewood to heat their homes. All available money went into buying what little food they could and most survived off moose. Talking with the area biologist several years later during a moose working group for this game

management unit, he related that this one event wiped out the moose population in that area, and it took several years for the population to rebuild. Salmon are central to the subsistence harvest of this community, and to all communities Bristol Bay and neighboring regions like Cook Inlet. Alternatives come at a price. It is difficult to substitute another species for salmon, a species so heavily relied upon for subsistence in terms of food security. The story told by Eklutna Jim holds true into the present; it is salmon which fills the caches, ensuring community survival.

Commercial fishing is also an important part of the local economy, providing an income to communities, as well as boats and equipment that can also be used in subsistence fishing. Today, many residents in rural subarctic coastal communities in Alaska participate in a commercial fishery in some way as they have for generations. In many communities, commercial fishing has become a status marker for residents whose outward portrayal of themselves as fishermen reflects on the community as a whole (Reedy-Maschner 2010:28). Commercial fishing can provide a good income, but that's not always the case.

In recent years residents in Alaska's rural communities have been concerned about an economic downturn that may be leading to disruptive cultural and social impacts on local communities (Donkersloot and Carothers 2016:39; Fall, et al. 2006b; Holen 2011; Krieg, et al. 2009). Some of the economic changes stem from low salmon prices paid to commercial fishermen in the 1990s and early 2000s. In addition, participation in the commercial fishery became more complicated for residents of rural fishing communities after the implementation of the limited entry system in 1975 that gave permits to those who could demonstrate an economic dependence and past participation in commercial fishing (Langdon 1989:326). More wealthy individuals in tribal communities control the capital necessary to finance boats where the permit to participate in the competitive fishery has become a

valuable commodity. This exists within tribal social environments where social elites created through powerful kinship networks control access to the capital necessary for financing fishing (Schroeder 2003:438). According to Langdon in his research in Southeast Alaska among the Tlingit, "the social obligations and reciprocity between generations to provide for each other, characteristics of the traditional house group [kin-related social networks], appear to have declined substantially" (1989:327). Eventually elders who held permits, sold those permits to those who could pay. Permits were sold to more wealthy families or to outsiders leading to a decline in the limited-entry permits held by rural residents in the 1980s. With the sale of local family permits to outside entities, members of the younger generation especially are slowly migrating to urban Alaska cities, as they can no longer afford to live in rural communities where the cost of living is often higher than that of urban centers (Aarsæther, et al. 2004; Carothers 2010; Fall, et al. 2006b; Holen 2009b; Krieg, et al. 2009). It is difficult for the younger generation, if they are not connected to the right kinship network in a community, to raise the capital necessary to buy a permit and finance a boat to participate in the commercial fishery (Donkersloot and Carothers 2016:33).

Besides the commercial fishery, subsistence is also an important component of the local economy. Subsistence harvests in Alaska are still relatively high compared to other Arctic areas (Poppel 2006:68). However, participating in a subsistence lifestyle is increasingly becoming increasingly more complicated as incomes in rural communities shrink and many residents can no longer afford such equipment necessary for engaging in subsistence such as boats, ATVs, gas, and bullets. The harvest of wild foods in rural Alaska remains a key factor for providing for food security, as the cost of transporting food to rural communities is high. However, the subsistence economy is intimately tied to the cash economy, leaving rural communities in Alaska vulnerable, especially with a declining participation in commercial fishing by

local residents. During this process of change, some communities do not succeed in retaining a viable population. In many cases, it is young people and young families that migrate to urban centers in search of jobs, disrupting the social fabric of the community.

Recent applied studies suggest that economic factors are the primary drivers for rural-to-urban migration (Aarsæther, et al. 2004; Holen 2009a; Krieg, et al. 2009; Stanek, et al. 2006; Stanek, et al. 2007). However, missing from these applied studies is an exploration of the cultural and social impacts on rural coastal communities due to declining populations. This study asked questions to residents such as if they plan to move out of their communities in the future, and if so, what are their motivations. At the same time, questions were asked why residents continue to live in their communities, especially if these reasons correspond to participation in fishing. There are some small communities where there is a high level of participation in commercial and subsistence fishing and these communities seem to have maintained their populations over time. This study seeks to understand if fisheries contribute to the resilience of communities, and how local-level politics and strong internal leadership at the individual level, facilitates or influences how individuals and families, and in the larger scope communities, adapt to change.

Fishery economics is a good place to begin a research project such as this as fisheries, especially salmon fisheries, are a dominant part of the economic structure of rural coastal communities in Alaska. Examining communities purely through economics does not consider the profound impact fisheries play in the daily lives and culture of the communities. Such research should also incorporate knowledge and praxis of the participants in the kinds of social relations and communitas that is fishing (Olson 2005:261; Turner 1969). In these communities, fishing is intimately tied to communal and cultural notions of identity (Bourdieu 1977; Dombrowski 2007; Palsson 1994; Sider 1986). Engaging in subsistence and

commercial fishing, in terms of practice and praxis, and the passing down of local knowledge about fishing to the next generations within extended kin-based groups, is one of the prime motivators for continuing to live in rural communities (Dombrowski 2007:217; Tanner 1979). This study will examine how knowledge and skill is transmitted from one generation to the next through such fishing activities as commercial fishing, but mainly through subsistence fisheries where notions of reciprocity and social relations are linked to practice and knowledge.

To maintain that connection to place and resource, the community must be viable economically; a place where residents will continue to live and make family and community connections while living meaningful lives (Aarsæther, et al. 2004:139). The maintenance of this system that allows for economic viability at household and community levels necessitates the outward representation and portrayal of identity as fishers and fishing communities to managers and other decision makers (Holen 2004; Olson 2005; Reedy-Maschner 2010). This occurs at both the structural (Leach 1954) and symbolic levels (Dombrowski 2002; Turner 1969) within a larger system, both in terms of individual and community agency.

Research Design

Subsistence economies are well documented through applied research conducted in these rural coastal communities in subarctic Alaska (Fall 1996; Fall, et al. 2006a; Fall, et al. 1983; Fall, et al. 1999; Holen 2009a; Krieg, et al. 2009; Krieg, et al. 2005; Stanek, et al. 2006; Stanek, et al. 2007). What is missing from this research, however, is the economic reality that residents face in the mixed economy, as well as cultural and social factors that may lead to the success or failure of coastal communities during periods of stress. Small-scale fishing communities are composed of social networks that are intimately linked to

the surrounding ecological system. At the same time intensive management occurs in Alaskan fisheries and local residents work as agents within this system to ensure that adaptation occurs during these periods of stress. Stress can be mitigated through networks of influential agents of change within the community including those that hold political power, social status, or economic power such as the most productive fishers in the economy, locally called the "highliner" in Alaska (Robards and Greenberg 2007). Strategies for mitigating ecological, economic, and political stress can be observed especially in small scale fisheries (Perry and Ommer 2010; Pollnac and Poggie 2006).

Cultural, economic, and social mitigation then can lead to a viable community when positive internal leadership and support networks are present (Aarsæther, et al. 2004; Dombrowski 2001). In Alaskan fisheries, these factors are not well understood. For example, the Arctic Human Development Report (2004:11) calls for studies to address "a better understanding of the effects of cumulative changes on cultural identity and social well-being."

What is known through research that I have already conducted is that community viability in small coastal communities in Alaska can be measured through such factors as subsistence opportunities, economic opportunities, and social activities in the community. Research by Dombrowski showed that community viability is more complicated and involves additional factors such as local leadership, family, and community engagement or participating in community activities (Dombrowski 2001). This study is ethnographic in nature focusing on internal social factors of community viability as well as external factors associated with the commercial fishing sector such as studies carried out by Carothers (Carothers 2012; Carothers 2015) in Kodiak and by Reedy (Reedy-Maschner 2012; Reedy-Maschner 2010) in the Aleutian Islands. Although there have been other recent studies that described social indicators associated with fisheries focusing on quantitative analysis of community resilience (Himes-Cornell and

Kasperski 2015; Jepson and Colburn 2013), it is recognized that more in-depth ethnographic analysis is needed (Blount, et al. 2015). The dissertation examines the politics that are inherent in any small community, how and if those politics are projected in the larger public arena and how fisheries create places where people want to continue their livelihoods and raise their families.

Each of these study communities is a fishery dependent community, a community where fisheries including the subsistence, sport, and commercial sectors are important factors in the ensuring food security, economic viability, culture, and a way of life for the community. The three case study communities demonstrate differing politics involved in both subsistence and commercial fishing as the fisheries are managed separately; Kokhanok is part of the Bristol Bay fishery, Chenega Bay is part of the Prince William Sound fishery, and Tyonek is part of the Cook Inlet fishery. This management setting allows for place-based and in this case, fishery-based politics, and the examination of community through notions of value and praxis (Olson 2005:254); a component of a process propelled by human agents striving to produce a community of social, economic, and political relations (Schroeder 2003:450). When viewing how community is produced and symbolized, then management can more fully understand the deeper issues that affect community without reducing the discourse to economics.

Research Questions

The research project on which this thesis is based focuses on the three study communities located in subarctic Alaska. Community residents were interviewed to understand the role of the commercial and subsistence fisheries in the local economy. The questions posed to community members during surveys and semi-structured interviews address how both commercial fishing and subsistence fishing are important for the maintenance of economic and social viability in each community. It is already known

that there is a correlation between commercial and subsistence fishing as households with high economic inputs from the commercial fishery often also harvest large amounts of wild foods, as they have the equipment and fuel to successfully participate in fishing activities (Wolfe, et al. 2010:21). Secondarily though, the questions tried in different ways to get at the underlying theme that fishing is a significant factor in the creation of community and cultural attitudes, values, and beliefs.

During the design of this project it was recognized early on, based on previous research, that changes in demographics, transportation technology, socio-cultural, economic, and environmental factors have shaped commercial fishing and subsistence efforts over time. What this project explores then is the contemporary context, the recent past and the present livelihoods and sense of well-being of people in these three study communities. This research is guided by three research questions based on an evaluation of existing data related to socio-cultural, economic, food security, and studies worldwide related to fishing economies and long-term viability. The three research questions are:

1. How do people in different areas of Alaska articulate the role of subsistence fisheries in their communities?
2. What factors are impacting participation in commercial fisheries?
3. What methods could be used to assess the resilience and vulnerability of diverse coastal communities in Alaska?

The last question really seeks to explore whether resilience can be measured and if so, are there recommendations on how to do this. As noted earlier, studies focused on using social indicators, quantifiable indicators using available statistics for communities (Himes-Cornell and Kasperski 2015; Jepson and Colburn 2013). This study was more qualitative in nature focused on providing a contemporary ethnography of diverse fishery dependent communities in coastal Alaska.

METHODS

This project was guided by the research principles outlined in the Alaska Federation of Natives Guidelines for Research and by the National Science Foundation, Office of Polar Programs in its *Principles for the Conduct of Research in the Arctic*, *the Ethical Principles for the Conduct of Research in the North* (Association of Canadian Universities for Northern Studies 2003), the University of Alaska Fairbanks Institutional Review Board policy governing human subjects research, and the Alaska confidentiality statute (AS 16.05.815). These principles stress community approval of research designs, informed consent, anonymity or confidentiality of study participants, community review of draft study findings, and the provision of study findings to each study community upon completion of the research.

In keeping with the principles of research conduct, I visited each local community tribal government to ask for permission to conduct research. The field research employed two integrated social science data gathering methods. These are 1) systematic household surveys to gather quantitative data to document salmon harvest, participation in fishing activities, and attitudes and perceptions of community and fisheries, and 2) key respondent interviews to gather qualitative information related to resident's history in both the subsistence economy and commercial fishery, as well as discussion related to what residents value most about their community. Both components of the study were aided by a local research assistant (LRA). Upon approval from each community government, local leaders provided names of possible LRAs to assist in administering surveys and arranging key respondent interviews. Having worked in rural communities for ten years, I know the value of providing compensation to LRAs for their time. The LRAs were compensated $25 for each survey they completed and $50 for each interview they arranged. Local residents who agreed to be interviewed were provided an honorarium of $100-$200, depending on the length of the interview.

HOUSEHOLD SURVEYS

Systematic household surveys were administered in each study community between February and April 2012. The household surveys addressed demographics, the harvest and use of salmon, salmon removals from individual commercial catches for household consumption, household participation in both the subsistence and commercial fisheries, equipment and fish camp location information, past participation in commercial fishing, participation in political and regulatory activities, and attitudes about community and fisheries (Appendix A). As all three core study communities were small the sampling goal for the household survey was to sample a census of each community. In Chenega Bay and Kokhanok, one LRA in each community was employed to conduct the survey and facilitate key respondent interviews, and two LRAs were hired in Tyonek. There was a total of 16 households interviewed in Chenega Bay out of 18 households (89%), 43 households in Kokhanok out of a total of 47 households (92%), and 38 households in Tyonek out of 63 households (60%) (see Table 2-1 in the next chapter for sampling characteristics).

Harvest assessment surveys documented the 2011 calendar year (January – December) and included a mapping component to document harvest locations of salmon. Harvest locations, as well as the harvest data, can be compared to harvests in recent years (Fall, et al. 2006a; Krieg, et al. 2009; Stanek, et al. 2007). Surveys were coded using numerical values and codes were created for answers to qualitative answers. The data were entered and analyzed by Information Management staff at the Alaska Department of Fish and Game, Division of Subsistence using a standard methodology. The map data were entered into ArcGIS 10.2 as individual feature classes for each community and includes fields for species, access, and month of harvest. The harvest survey has been included as Appendix A.

KEY RESPONDENT INTERVIEWS

Follow-up key respondent interviews were held in the communities in the fall of 2012 and winter of 2012-2013 to better understand the results of the household surveys. The follow-up key respondent interviews asked questions about values and attitudes regarding fishing, involvement in fishing, local level politics related to fisheries, and how fishing is important for family and community (Appendix B). Key respondents represented a diversity of ages and participation in fisheries, both commercial and subsistence. They were chosen based on recommendations from tribal council members and in consultation with either the LRA or another community liaisons that assisted in arranging interviews. In total, 24 key respondents were interviewed in the three study communities. Each key respondent signed a release to allow their names to be used in this study. Attributing names to the material provided throughout this study permits local voices to be heard and honor their participation in the study. The key respondent interviews followed a standard protocol and were semi-structured. Each was audio recorded and a complete transcription was made. The protocol, which is included as Appendix B, had key categories with main questions asked. It was expected that some of the information in subcategories would be answered by answering the main question. This did occur in many cases and respondents were able to answer the questions in their own way without too many prompts, allowing for a more informal conversation to occur.

ANALYSIS AND REVIEW

Based on an iterative evaluation of household surveys and key respondent interviews, the analysis and review was designed to understand cultural attitudes and values embedded in community based fisheries. For the household survey data, surveys were coded for data entry by Holen using standard conventions used by ADF&G to facilitate data entry by information management staff into a Microsoft

SQL Server. Double data entry occurred to mitigate errors and once confirmed the data was processed using Statistical Package for the Social Sciences (SPSS). Logic checks were run and harvest data were converted to pounds usable weight for standards set for each region (CSIS 2015). Harvest assessments and responses to all questions that were asked as part of the surveys were calculated based upon the application of weighted means (Cochran 1977; Sill, et al. 2017). For more information on the formulas used for data conversion and the process used to derive the harvest assessments and statistics see Sill, et al. (2017) for a standard discussion that applies to all tables and figures in this dissertation.

Harvest assessment tables include confidence intervals. The constant for 95% confidence limits is 1.96 (Sill, et al. 2017:21). In understanding the confidence in the data presented the smaller the percentage indicates that an estimate given is likely to be close to the actual mean of the sample, and a larger percentage then would mean the estimates presented in the tables and figures would be further from the mean of the sample (Sill, et al. 2017:21). As noted above, comparative communities have been included in this study and the same series of questions was asked in these communities in the same way so that a comparison could be made. For more information for data collection and analysis for the comparative communities see Marchioni, et al. (2016), Hutchinson-Scarbrough, et al. (2016), and Sill, et al. (2017).

Transcripts from the key respondent interviews, interview notes, and field notes were coded using Nvivo 10 qualitative analysis software. The coding structure came from the outline for this thesis which is based on the research questions as well as a preliminary analysis of both the qualitative and quantitative data. Additional notes were created during the coding of the transcripts as new themes became evident. Data from the literature review, photographs that were taken during this research project, audio recordings, etc. were also coded and imported into Nvivo 10.

Comparative Case Studies

To gain a broader understanding of community based fisheries, questions were also inserted into surveys being conducted in other coastal communities in Alaska. It was known at the time of the surveys which communities were thriving as a result of their fisheries and which were encountering challenges. However, as with the outcome of the research in the three study communities, some surprising results came out of the analysis of the research findings. For example, how diverse economies exist for communities in relatively close proximity with one another that also have close kinship ties, such as in the Chignik area. This thesis will draw on the questions asked in these other communities to compare how unique these three communities are and if something can be concluded about community based fisheries in general (Figure 1-1).

Organization

Following are two background chapters, Chapter 2 describes salmon fisheries in the North Pacific and the study communities, while Chapter 3 covers local level politics, local knowledge, and social ecological systems that will frame the way in which the data in findings chapters are presented and analyzed. The three research questions, which formed the framework for this investigation, benefited from a synthesis of the methods employed in this study, household surveys and key respondent interviews. The quantitative data derived from the surveys answered questions about participation in commercial and subsistence fisheries, as well as attitudes and perceptions about community viability. Key respondent interviews helped to answer questions about the intersection of the two fisheries, and whether these methods were useful in measuring resilience in fishery dependent communities. These will be explored further in Chapters 4, 5, and 6. These three chapters describe research findings and are organized under three themes: subsistence, culture, and economy. The focus and structure of these three chapters on

subsistence, culture, and economy are a result of the study findings and discussions in Chenega Bay, Kokhanok, and Tyonek where residents described that salmon fishing is important for their life as they relied on salmon for subsistence, for cultural continuity, and for economic reasons. The last chapter summarizes the findings and provide an overall comparison of the case study communities within the larger framework of fishery dependent communities.

Chapter 2 – SALMON

COMMERCIAL FISHING ECONOMIES

As shown in Figure 2-1, 98.2% of the harvest of wild foods was commercial fishing in 2012 (Fall 2014:327). Alaska's commercial fishery is robust, for example in 2010, commercial landings in Alaska were valued at over $1.5 billion dollars, which represented 35% of the total landings made in all U.S. ports (Himes-Cornell and Kasperski 2015:2; NMFS 2011). In 2011, the seafood industry in Alaska employed 63,100 people directly, or 1 in 8 Alaska workers (McDowell 2013). Commercial harvests of salmon, halibut, marine invertebrates, and other fish are important for residents of rural communities for both income in the commercial fishery and are also removed from commercial harvests for home use.

Commercial salmon fishing in Alaska is managed by the Commercial Fisheries Entry Commission (CFEC) which "engages in statutorily mandated activities to the term of the Limited Entry Act (AS 16.43.010) of 1973" (CFEC 2015a). The CFEC issues limited entry permits and vessel licenses and collects data useful to the Alaska Department of Fish and Game for managing fisheries as well as the Alaska Board of Fisheries for making regulatory decisions. All salmon in Alaska are wild stocks as there are no salmon farms as there are in other northern countries, although escaped farmed salmon are becoming a problem in some parts of Alaska such as Southeast Alaska.[3] In 1989, Alaska banned finfish farming primarily based on concerns surrounding the commercial fishery to prevent a loss of revenue for local

[3] Although all salmon are wild stocks, there are salmon hatcheries in the Gulf of Alaska which are important for commercial fisheries to increase stock abundance.

fishery dependent communities and due to concerns that were emerging in regard to ecological damage and disease transmission from farm raised fish to wild stocks (Robards and Greenberg 2007:17).

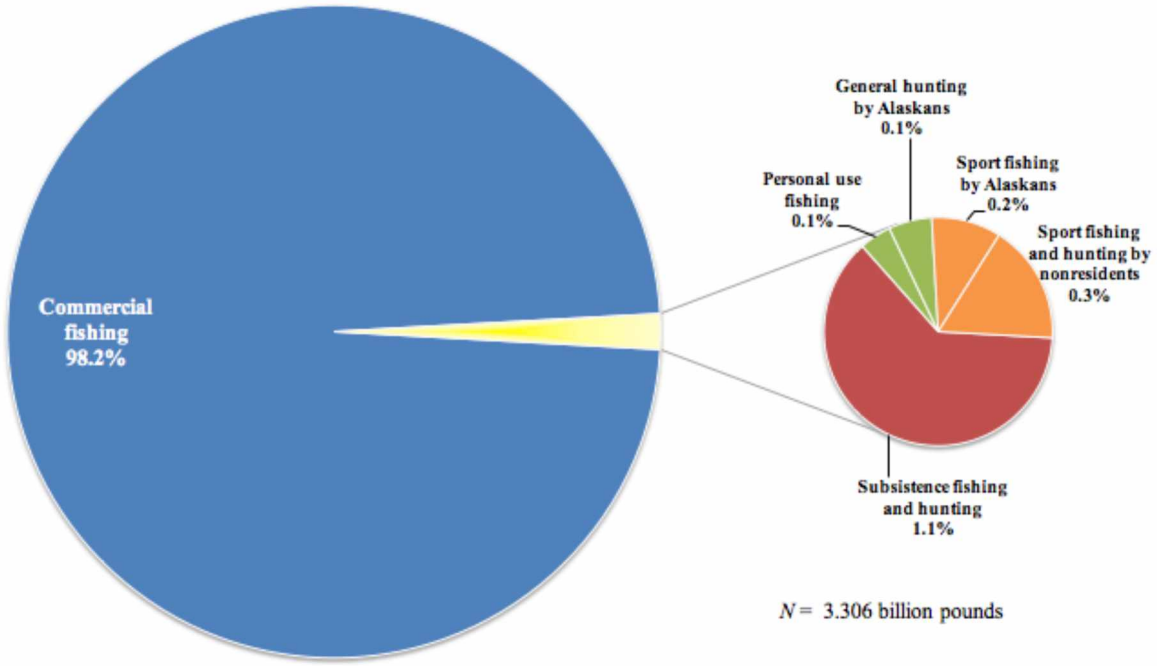

Figure 2-1. Harvest by user in Alaska

Source: Adapted from Fall 2014

According to the CFEC (2015a:7), Alaskans hold around 77% of all limited entry permits, with rural Alaskans holding more than half of those permits. In 2014, there were 10,118 vessels participating in commercial fisheries in Alaska with 17,293 permits (CFEC 2015a:25). The Limited Entry Act established entry permits for the commercial harvest of fish that fall under State of Alaska jurisdiction and it created the CFEC to administer the permits and the program (Reedy-Maschner 2007:214). Residents of Alaska had to apply for a permit and permits were issued on a point system using the factors of residency (seasonal residents could use addresses where they fished or by using a cannery address), consistent participation (measured by frequency of fishing in a season), crew participation, vessel and gear ownership, availability of alternative occupations, and income dependency (CFEC 2015b; Reedy-Maschner 2007:2015). According to Reedy-Maschner (2007:2011) the limited entry program was a conservation program by the Alaska Legislature to reduce overcapitalization of Alaska's fisheries and had the outcome of restricting the number of fishers in the North Pacific.

Alaskans have experienced mixed results in the commercial fishery with limited entry through the shift from a fishery that was seasonal in nature to one that came to be driven by intensive capital expenditures. Carothers (2010:96) notes that "the nature of adaptive fishing participation, that is, fishing when income is needed, adjusting to seasonal and annual ecological and economic fluctuations, has been impacted by policies that have necessitated large capital expenditures for purchasing harvest rights and a more permanent, continuous engagement with commercial fishing." The Limited Entry Program created wealth for those that were able to stay in the fishery. By the early 1980s many permits were worth hundreds of thousands of dollars and those in more lucrative fisheries were worth up to $400,000 (Braund 1986:16). Knapp notes that in the Bristol Bay fishery the highest-earning participants earn an average of three to four times as much as the lowest-earning permit holders (Knapp 2011:660).

Participants in Alaskan fisheries that were able to obtain permits for multiple fisheries could make a living by working throughout the year. Spouses who once had to work cannery jobs while their spouse fished were able to shift their focus to the family fishing business. This meant that canneries had to bring in an outside workforce. This workforce gradually replaced the local workforce who focused their efforts on fishing instead of processing. Cannery jobs came to be considered undesirable (Reedy-Maschner 2007:219).

The Limited Entry Program, especially in the smaller rural communities throughout Alaska, had the effect of creating a higher value fishery but also an expensive fishery to enter through capital intensive costs including permits and boats that grew bigger each year as the fishery became more valuable (Braund 1986).[4]

As noted earlier, Langdon describes the effects of the Limited Entry Program on the social dynamics of a community.

> The social obligations and reciprocity between generations to provide for each other, characteristics of the traditional house group, appear to have declined substantially. Many of the elderly felt no responsibility to keep the permits in the family, because they apparently did not perceive the younger generation as capable of or committed to helping support them in their old age. The economists' view on this matter is summed up simply: The poor sell out cheaply (Langdon 1989:327).

The experience of the Limited Entry Permit system varied in different parts of Alaska, although there were some similarities in the first few years of the program as permits were sold to outside interests. For example, in Southeast Alaska, young Tlingit and Haida lacked the financial resources and social

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[4] Salmon fisheries are not unique in the North where commodification of resources has caused strain on communities. For example, see Thornton et al. (2010) for a synthesis of herring in the Pacific Northwest, Dombrowski (2002) for a discussion on timber politics in Southeast Alaska, and Bielawski (2003) for a discussion on mineral extraction in Arctic Canada.

capital to obtain permits that elders were selling. According to Langdon (1989:327), the number of permits held locally in communities in Southeast Alaska declined as permits were sold mainly to fishers from outside the communities and Alaska. An analysis of transfer patterns in 1980 by Langdon revealed that rural holdings of purse seine permits, one of the most valuable permits in Southeast Alaska, had declined by 30 percent from 1975 to the later part of 1979 (Langdon 1980:26). Most of the permits were sold to non-native fishermen in Seattle, who were able to gain access to loans to purchase permits (Langdon 1989:327). In some communities, the commercial fishery has been completely abandoned. On a recent visit to the community of Angoon in September 2014, I observed few commercial fishing boats in the harbor. The beach of a cove nearby is covered with 30-40 fishing commercial fishing boats that have been stripped of their engines and usable parts. The boats tied to the docks have not been moved in years and in some cases there is vegetation and trees growing on the boats.

In Kodiak, where there are six rural communities that rely on commercial fisheries, as well as the city of Kodiak, one of the largest fishing ports in the U.S., there were similar concerns. "In the Kodiak villages, family-run boats were common. The partnership and kin-based model of running a fishing operation did not match the individualization model of the limited entry permit system" (Carothers 2010:102). In Kodiak during the shift to Limited Entry, some residents feared that although communities would benefit in the short term, eventually it would mean that the younger generation would have a disadvantage accessing the fishery due to the high cost and limited number of permits (Carothers 2010:104-105).

Limited entry caused disruptions in traditional social structures on the Alaska Peninsula community of King Cove.

> Limited Entry changed the social, political, and economic landscapes of the Aleut village of King Cove. The implementation of Limited Entry was inequitable, benefiting select Aleut men from prestigious families and further exaggerating socioeconomic disparities. It prompted those without permits to either emigrate or stay in the community and remain disenfranchised from captaincy. The policy solidified the structure in which men can achieve status and created a career crewmember class. It also changed the nature of subsistence obligations (Reedy-Maschner 2007:220).

As Reedy-Maschner relates about the out-migration of local fishers on the fishing grounds,

> For decades local and transient fishermen have fished alongside one another, even collaborating on the fishing grounds. In the smaller villages, however, the limited number of permits, the rates of transfer away from villages, the lack of "right of first refusal" to buy permits locally, and the general open market for permits has changed the rations of local to transient (Reedy-Maschner 2012:116).

In Alaska, the recognition that fisheries are impacted by the marine ecosystem throughout the North Pacific has led to a range of changes in fisheries policies that began with the implementation of the Limited Entry Program. "The globalization of regulatory fisheries control (1990s to present) followed from the recognition that marine ecosystems have been altered throughout the world by intensive fishing, thus requiring stronger fishing regulations" (Perry, et al. 2011:428).

Commodification of fishery access has created a situation where it is economically difficult to enter a local commercial fishery leading to a local decrease in participation. The "rapid decrease in fishing participation has brought about challenges to the subsistence economy which depends heavily on access to commercial fishing; village depopulation; economic and social displacements; and an 'in-between' or lost generation of young people, the majority of whom are not involved in fishing-based livelihoods" (Carothers 2008).

"While knowledge of the marine environment is still taught to the young through subsistence and recreational practices in many villages, the skills of commercial fishing – growing up on a boat and

gaining competency before the teenage years is for most people no longer occurring" (Carothers 2010:107). One resident of Kokhanok interviewed for this study, Gary Nielsen, who fishes commercially, related how there are fewer permit holders in the community. Today according to Gary and other Kokhanok residents, anywhere from 30-40 Kokhanok residents travel to Bristol Bay to fish, but 90% are crew members on boats or assisting at set net sites. Kokhanok residents note that there are about seven permit holders in the community who continue to fish annually. One Kokhanok resident says that it's impossible to make a living off fishing anymore, but back in the 1980s when prices were $2.50 a pound then yes you could make a living, but not anymore.

Gary Nielsen said the average is to bring back around $9,000 from 5 weeks of work as a permit holder. It's not a living but a supplemental source of income. The overhead is high, the price of fish is low, and fishing openings are competitive. Many young people are choosing not to participate in the fishery and families who held out for many years waiting for prices paid for salmon to go back to the prices paid in the 1980s that made fishing economically feasible may choose not to "Ride out the storm" (Perry, et al. 2011:440). Leaving the commercial fishery means ultimately when the fishery recovers there will be fewer youth to enter the fishery again as not only will the permits and boats have been lost, but the skills necessary to fish will have been lost. This is a common response for resource dependent communities (Perry, et al. 2011:440). Residents don't just have to deal with the natural fluctuation in fish stocks; they also have to deal with the fluctuations in markets for fish, and the market for the commodity of boats and permits that are necessary for fishery dependent communities.

SUBSISTENCE ECONOMIES

Subsistence in Alaska is a broad ranging category that refers to both a management regime and a way of life that is meaningful to residents of rural Alaskan communities. ADF&G defines subsistence as the customary and traditional uses of wild resource for food, clothing, fuel, transportation, construction, art, crafts, sharing, and customary trade (ADF&G 2015). To many, subsistence is considered an activity or way of life. Harvesting wild resources in Alaska occurs under several regulatory regimes. Most fish harvested by rod and reel occurs under sport fishing regulations, the use of nets to harvest salmon for home use is considered subsistence, game harvested under general hunts is considered sport hunting, and residents who fish commercially often retain fish for home use which is often called "home pack" under commercial fishing regulations. State and federal lands often have different seasons, gear allowances, and bag limits for harvest and game populations and fish stocks. This complexity of regulations for Alaskans to navigate in their efforts to harvest wild resources for home use and to share with family and community is often difficult to navigate.

The subsistence way of life in Alaska involves harvesting wild resources to meet the needs for nutrition, personal, family, and community well-being, as well as spiritual and ritual ties to the land and to the animals, fish, and birds that are harvested. In Alaska and other areas of the North there continues to be strong cultural traditions governing human-environmental relations. Practices embedded in what we call Traditional Ecological Knowledge (TEK) are largely dependent on social mechanisms that have a cultural as well as pragmatic nature. It is a worldview that incorporates cultural values, ethics, and the basic norms of society, or what would be considered right conduct in human-environmental relations (Berkes, et al. 2000:1256).

Subsistence practices differ but are closely tied to other activities relating to wild resource harvests. Commercial and subsistence fisheries are interrelated as fishing equipment is often used for subsistence fishing outside commercial fishing periods (Wolfe, et al. 2010:21). In addition, households with fishing permits are often high producers of subsistence foods. A household's wild food harvest increases by 125.8% if the household is also involved in commercial fishing (Wolfe, et al. 2010:23). In terms of subsistence, harvests in Alaska are still relatively high compared to other Arctic areas (Poppel 2006:68). In addition, residents of both urban and rural communities in Alaska engage in sport hunting and fishing. Subsistence users harvest 1.1% of wild resources while sport activities account for the other .7% (see Figure 2-1).

Dual Management in Alaska

Subsistence regulations in Alaska are defined by both state and federal agencies. This leads to what managers refer to as "dual management." The State of Alaska passed the subsistence law in 1978 providing a priority for subsistence over other consumptive uses of wild resources. Federal lands in Alaska comprise some 60% of Alaska (222 million acres) of which 80% is set aside for public use (ADNR 2000). Twenty-eight percent of Alaska is designated state lands. In addition, under the Alaska Native Claims Settlement Act (ANCSA), Alaska Natives received 44 million acres, which is considered private and managed by Alaska Native corporations that were created as part of ANCSA. Other private lands make up less than 1% of the total land area of Alaska. Federal and state regulations differ as to harvest limits and seasons.

Alaska seeks to manage wild resources for maximum opportunity for the residents of Alaska as well as visitors to the state. These opportunities are offered through general hunts and sport fishing. If there is a conservation concern, a fishery or hunt may be restricted to Alaska residents only, referred to as Tier I.

If the harvestable surplus of a resource cannot sustain all Alaska residents, then a Tier II fishery or hunt is established. The Alaska resident must apply for the opportunity to participate in the hunt or fishery by demonstrating through a series of questions on the application a long term, consistent, and continued dependence on the resource. Under Alaska state law, since 1989 all residents of Alaska qualify to participate in subsistence. Since the passage of the subsistence law in 1978, the Alaska Board of Fisheries and Game have made customary and traditional use findings for populations of game and stocks of fish throughout the State of Alaska. The subsistence way of life is identified in regulation as a way of life that is based on consistent, long-term reliance upon fish and game resources for the basic necessities of life (Alaska Administrative Code 99.005).

Federal law provides for a rural preference to subsistence unlike the State of Alaska which provides for subsistence for all Alaska residents. Title VIII of the Alaska National Interest Lands Conservation Act (ANILCA) enacted in 1980 created 10 new National Parks and Preserves on existing federal lands in Alaska, and in this process, priority was given to residents of rural communities that border or are located within these lands. To manage ANCSA lands, the Federal Subsistence Board was created as well as the Office of Subsistence Management at the U.S. Fish and Wildlife Service. The Federal Subsistence Board adopted a similar process of customary and traditional use findings based on State of Alaska procedures. These two competing laws, the Alaska Subsistence Law and ANILCA, are commonly referred to by Alaskans as the "subsistence dilemma." Federal lands often have hunts that follow state seasons and harvest limits in an attempt to streamline regulations to make it less confusing for local users. However, there are still cases where regulations make it confusing for local users. For example, in the community of Port Alsworth in Lake Clark National Park and Preserve, near the study community of Kokhanok, a fisher needs a State of Alaska issued subsistence permit to participate in the subsistence

gill net fishery, however, only residents of Port Alsworth and other resident zone communities of the park and preserve may participate. On federal ANILCA lands and waters, subsistence hunts or fisheries are often restricted to local residents in an attempt to provide a greater opportunity to local users. This often leads to confusion as crossing from federal land to state land could mean moving from an area where hunting is open to where it is closed. Varying court cases and efforts by the State of Alaska have tried to amend this impasse; however, resolution will likely require a change in the Alaska constitution providing a rural priority to comply with Title VIII of ANILCA.

Subsistence Economies throughout Alaska: How Important is Salmon?

Although the State of Alaska constitution does not recognize a rural preference for subsistence it does recognize that residents of rural communities have a customary and traditional use of wild resources. As noted above, in 1978 the State of Alaska enacted the Alaska Subsistence Law recognizing the customary and traditional use of wild resources by rural residents. This act also laid the groundwork for the Division of Subsistence, within the Alaska Department of Fish and Game. One of the main tasks of the Division is to quantify harvests of wild resources by mainly rural Alaska residents. From this data, community wide estimates of wild resource harvests are established. Since 1980, ADF&G has conducted harvest assessment surveys in 277 communities throughout Alaska documenting the harvest of all wild resources. Since 2009, the number of communities with comprehensive surveys has increased to meet data needs for a growing number of resource development projects. Most communities that have not been surveyed are outside State of Alaska designated non-subsistence areas. Those areas are near the major urban centers of Anchorage, Fairbanks, Ketchikan, Valdez, and Juneau. These areas were established in 1992 by the Alaska legislature and the only consumptive uses of fish and game that can

occur are general hunts, personal use fisheries, and sport activities. Subsistence regulations may not be adopted within a non-subsistence area.

As part of the customary and traditional use findings process, harvest survey data as well as permit data for fisheries or harvest ticket data for game are used to inform the Boards of Fisheries and Game so they may set the amounts reasonably necessary for subsistence, or ANS, for each stock of fish or population of game. If the population of a caribou herd diminishes for example, and the harvestable surplus of that herd falls within the ANS range then the herd goes into Tier I or Tier II status. To provide data, household harvest surveys are carried out face-to-face in each household to record demographics, harvests, sharing and distribution of wild resources, and the cash economy including jobs and income. The surveys record use, attempt to harvest, harvest, and sharing for each possible wild resource that could be harvested in an area. Harvests of wild resources are also mapped, recording a variety of attributes such as month, access to resource, and gear type. In addition, surveys include food security questions and other questions to provide for Health Impact Assessments. Findings from some of these surveys have been included in this study.

Surveys completed over the past 30 years have found that there is not one subsistence economy in Alaska; there are many subsistence economies and they vary by region of the state and even between neighboring communities. Alaska's ecosystems and available resources are diverse and include environments stretching from the high Arctic along Alaska's northern coastal plain orientated to the Arctic Ocean, interior Alaska with its boreal forest environment, Southwest Alaska with its expansive tundra and multitude of river systems, the rainy windswept islands of the Aleutians, and the temperate rain forests of Southeast Alaska. Salmon (32%) makes up the highest percentage of harvest overall measured in edible weight across the State of Alaska. Large land mammals such as moose, caribou,

bears, and deer make up the second highest percentage (23%) of harvest in Alaska. Also important are other finfish (21%), especially in coastal communities where halibut and cod are available and communities in the Arctic interior of Alaska where whitefish, sheefish, and grayling are more abundant than salmon. Marine mammals (14%) such as harbor seals are harvested in many coastal communities in Alaska and whales are harvested in the Arctic. Wild plants such as berries and other edible and medicinal plants make up 4% of the harvest statewide, birds and eggs including migratory waterfowl and upland game birds make up 3%, and shellfish such as clams, crab, and other marine invertebrates comprise 3% (Fall 2014). Figure 2-2 shows the composition of harvests by region in Alaska. Salmon are common in many areas of Alaska, making up over 50% of the harvest in Southcentral and Southwest Alaska, whereas in the Arctic with low salmon abundance, households harvest more marine mammals. Large land mammals such as moose and caribou comprise a larger percentage of the harvest there than in other areas of Alaska.

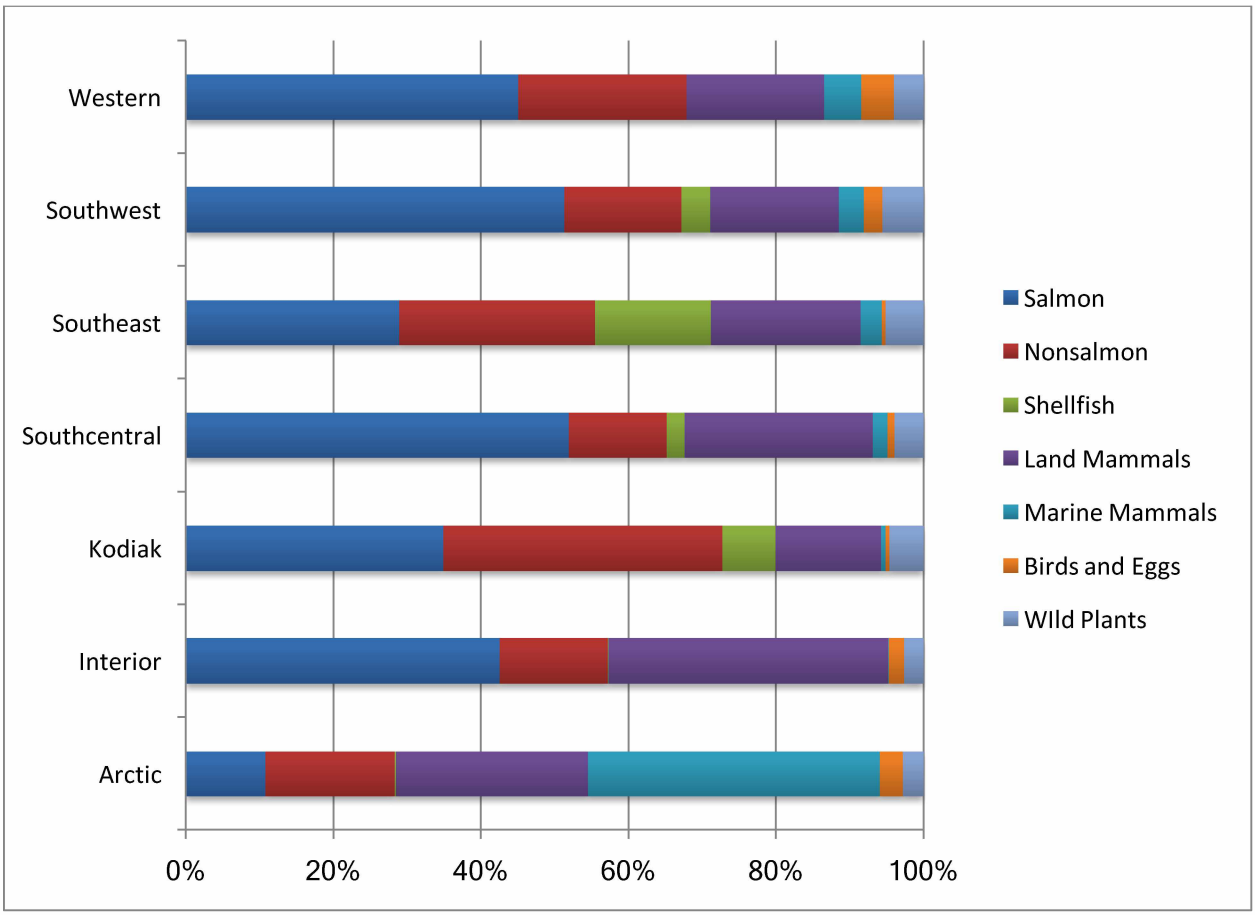

Figure 2-2. Composition of harvest by region, Alaska

Source: Figure adapted from data provided by Fall, 2014

Although household surveys are typically not conducted in urban areas of Alaska, data is available from permits and harvest tickets. Harvests are typically higher in rural communities as compared to urban areas. Figure 2-3 shows urban areas in red and rural areas in blue. The harvest was lowest in Anchorage with an average of 17 pounds per person and highest in the Arctic at 438 pounds per person. Fall (2014) shows that participation in harvesting wild resources is high in rural areas of Alaska as well and varies by region. Game and fish harvest participation is highest in Western Alaska (70% and 98% respectively) and on average 60% of rural residents participate in harvesting game and 83% participate in harvesting fish.

In each case the number of households using wild resources is higher than those harvesting. Over the decades of collecting harvest data, the Division has found a general pattern emerge that on average, 30% of households harvest 70% of the resources in a community. These households tend to have higher incomes and spend more money on subsistence related gear such as boats, snow machines, nets, rifles, and fuel. This high harvest is then shared with family and neighbors in these small rural communities (Wolfe, et al. 2010; Wolfe and Walker 1987).

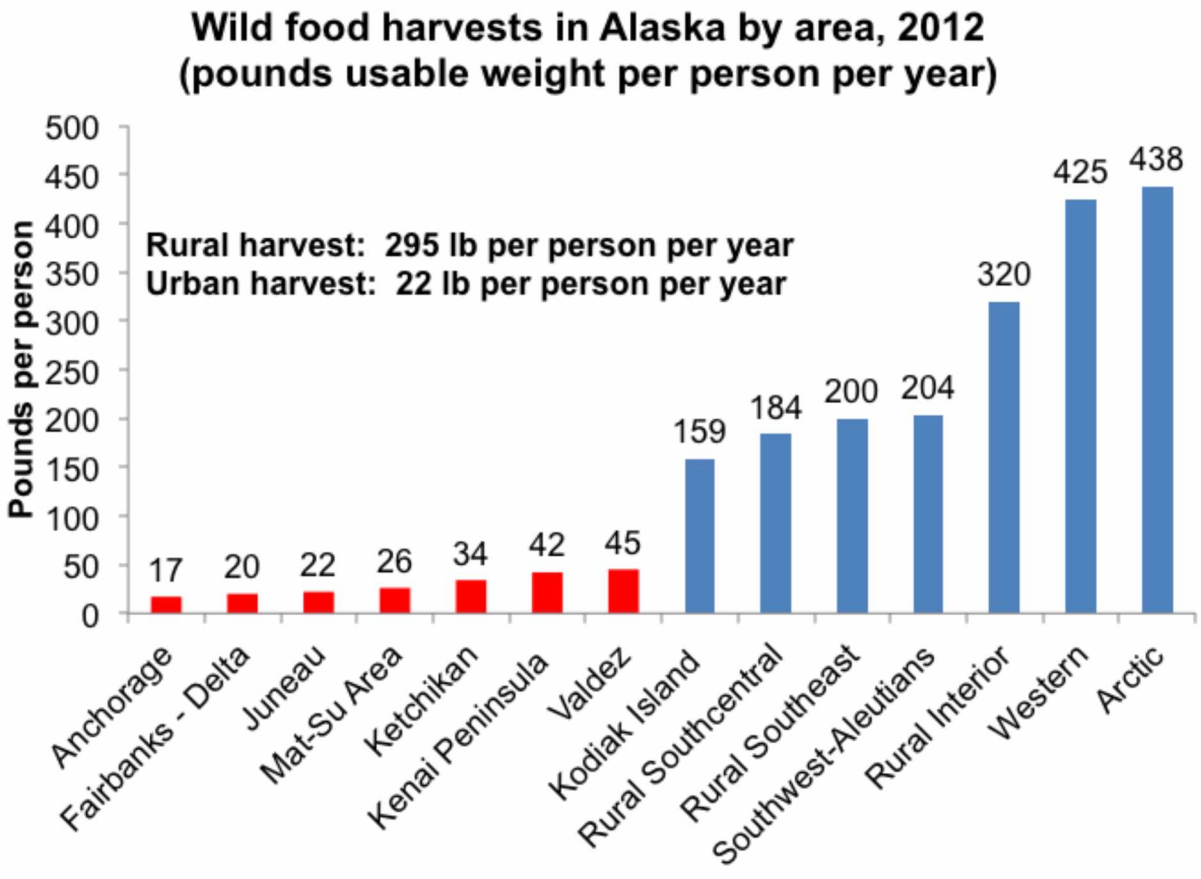

Figure 2-3. Harvest of wild resources, pound per capita, Alaska, 2012

Source: Fall 2014

CASH AND SUBSISTENCE ECONOMY

The cost of living in rural Alaska has risen significantly in recent years due to high gas prices for transportation. With few year-round ice-free ports, most goods must arrive in rural communities by air in winter. In the summer, coastal communities receive barges loaded with fuel and a year's worth of supplies from ports on the West Coast of the United States. Smaller barges transport fuel and supplies up major rivers such as the Yukon and Kuskokwim as well, cutting the cost of transportation. Residents must order one year's worth of groceries and other supplies to be brought in on the barge. In addition, during trips to Anchorage or other urban centers, rural residents stock up on supplies to be mailed back to their communities or pay freight fees on air transportation. Especially in winter, air transportation is the only reliable means to receive goods from urban centers. The increase in the cost of aviation fuel has significantly added to the cost for basic goods. When comparing costs in 2005, prior to the significant rise in gas prices seen in 2007 and 2008, the cost of groceries and basic necessities in subarctic Alaska was 2.23 times higher than in urban Anchorage, and 2.47 times higher in Arctic communities (USDA/UAF 2007). To offset some of these costs, Alaska Native residents receive dividends from shares held in both Alaska Native regional corporations and local village corporations. These arrangements are not universal across Alaska. In some areas of Alaska, such as the Northwest Arctic, some village corporations have dissolved or merged with the larger regional corporation. Each corporation is different in the resources it holds and payouts of dividends can reach $50,000, like in the case of a one-time payout by Cook Inlet Regional Corporation (CIRI) in 2000. Therefore, this income is not reliable. When it is paid out, residents often put the money back into the subsistence economy. In Tyonek, one of the study communities that received payments from CIRI in 2000, the payout led to new boats, motors, all-terrain vehicles, and investments in fish camps (Stanek, et al. 2006).

Subsistence is therefore a vital part of the economy in rural Alaska communities in maintaining the ability of residents to continue living in areas where jobs are harder to come by and the cost of living is higher. A 2012 summary of wild food production in Alaska by Fall (2014) estimated that the cost of replacing the wild food harvest of rural communities was $402,077,966 at a replacement value of $8 per pound. Residents in these communities are eating a higher percentage of protein in their diet than the national average due to their harvest of wild foods that averages anywhere from 159 lbs per capita edible weight found on Kodiak Island to a high of 438 lbs per capita in the Arctic. But the subsistence way of life is important for more than providing food to offset the cost of barging or flying in food. Subsistence is a customary and traditional way of life and the reason for continuing to live in a rural community surrounded by generations of extended family, as well as a traditional tie to the land and waters embedded in one's culture, as will be discussed in this dissertation. Subsistence in Alaska today is an activity that enables residents to continue a practice that has a significant cultural meaning. Culture in Alaska is not static and residents have adapted in order to survive, and even thrive in a modern world. Many residents of rural communities respond that they live two lives, their traditional way of life and the western way of living. Although incomes in rural communities are low, residents of rural Alaska stay in their communities to continue a way of life that is meaningful. Alaska is also undergoing a period of change where resource development is becoming more common, which allows residents to obtain jobs nearby their traditional communities, while working in fields that have higher incomes. However, residents see this as a tradeoff and long work weeks lead to less time for subsistence, although they provide the necessary means to pay for the material culture today that allows for the traditional subsistence economy to continue into the future (Holen 2009a).

STUDY COMMUNITIES

The three study communities were briefly introduced in the previous chapter. This section presents an overview of each community and includes data from the most recent comprehensive survey I conducted in each, as well as data from the survey conducted for this project. This will provide a brief history and demographic background for each community in order to better understand the uniqueness of each community. The approach taken in this thesis is to provide basic statistics, which for example is used in Chapter 4 on subsistence. This is the quantitative data, the statistical analysis on which to build an understanding of the deeper and more meaningful ethnography of each community, that being the qualitative data.

The first of the three core study communities is Chenega Bay, which is a predominately Alutiiq community located in Prince William Sound, the home of the Copper River fishery (Fall, et al. 2009; Fall, et al. 2006a; Simeone 2008). The traditional village of Chenega was destroyed by a tidal wave during the 1964 earthquake. Surviving residents of Chenega moved to Cordova, Valdez, or Anchorage. During the 1970s plans to re-establish the community were launched and Chenega as a community was re-established in 1984 at present day Chenega Bay (Simeone and Miraglia 2000:24). The contemporary community is a small fishing community that relies on salmon for both subsistence and jobs. In 2003, salmon comprised 48% of the total wild resource harvest of 471 pounds per person (Fall, et al. 2006a). Chenega Bay is also a community that was adversely affected by the Exxon Valdez oil spill in 1989. Chenega Bay has been included in this study as this community illustrates what happens when subsistence can no longer be relied upon to provide for food security, as was the case for several years following the oil spill (Gill 1994:223; Thompson 2005). During the 2011 study year, Chenega Bay had 18 households with an estimated population of 47 residents, of which 71% were Alaska Native (Table 2-1).

The mean household size was 3 with an average age of 35 years. Chenega Bay showed the biggest age cohorts for males in the 20-24-age category as well as 40-49. For females the largest age cohort was 10-14 years of age (Table 2-2; Figure 2-4).

Table 2-1. Demographic and sample characteristics, of sampled communities, 2011

Characteristics	Chenega Bay	Kokhanok	Tyonek
Sampled households	16	43	38
Eligible households	18	47	63
Percentage sampled	88.9%	91.5%	60.3%
Household size			
Mean	2.6	2.9	2.4
Minimum	1.0	1.0	1.0
Maximum	7.0	8.0	10.0
Estimated population	47.3	133.3	152.5
Age			
Mean	34.7	33.6	30.9
Minimum[a]	1.0	0.0	0.0
Maximum	88.0	80.0	83.0
Sex			
Estimated male			
Number	27.0	62.3	72.9
Percentage	57.1%	46.7%	47.8%
Estimated female			
Number	20.3	71.0	79.6
Percentage	42.9%	53.3%	52.2%
Alaska Native			
Estimated households[b]			
Number	13.5	41.5	61.3
Percentage	75.0%	88.4%	97.4%
Estimated population			
Number	33.4	122.4	147.4
Percentage	70.7%	91.8%	96.7%

ADF&G Division of Subsistence & UAF household survey, 2012.

a. A minimum age of 0 (zero) is used for infants that are less than 1 year of age.

b. The estimated number of households in which at least one head of household is Alaska Native.

Table 2-2. Population profile, Chenega Bay, 2011

	Male			Female			Total		
Age	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage
0–4	1.1	4.2%	4.2%	1.1	5.6%	5.6%	2.3	4.8%	4.8%
5–9	1.1	4.2%	8.3%	3.4	16.7%	22.2%	4.5	9.5%	14.3%
10–14	2.3	8.3%	16.7%	2.3	11.1%	33.3%	4.5	9.5%	23.8%
15–19	5.6	20.8%	37.5%	1.1	5.6%	38.9%	6.8	14.3%	38.1%
20–24	0.0	0.0%	37.5%	0.0	0.0%	38.9%	0.0	0.0%	38.1%
25–29	1.1	4.2%	41.7%	1.1	5.6%	44.4%	2.3	4.8%	42.9%
30–34	0.0	0.0%	41.7%	0.0	0.0%	44.4%	0.0	0.0%	42.9%
35–39	1.1	4.2%	45.8%	2.3	11.1%	55.6%	3.4	7.1%	50.0%
40–44	4.5	16.7%	62.5%	1.1	5.6%	61.1%	5.6	11.9%	61.9%
45–49	4.5	16.7%	79.2%	2.3	11.1%	72.2%	6.8	14.3%	76.2%
50–54	0.0	0.0%	79.2%	1.1	5.6%	77.8%	1.1	2.4%	78.6%
55–59	1.1	4.2%	83.3%	1.1	5.6%	83.3%	2.3	4.8%	83.3%
60–64	1.1	4.2%	87.5%	1.1	5.6%	88.9%	2.3	4.8%	88.1%
65–69	3.4	12.5%	100.0%	0.0	0.0%	88.9%	3.4	7.1%	95.2%
70–74	0.0	0.0%	100.0%	0.0	0.0%	88.9%	0.0	0.0%	95.2%
75–79	0.0	0.0%	100.0%	0.0	0.0%	88.9%	0.0	0.0%	95.2%
80–84	0.0	0.0%	100.0%	0.0	0.0%	88.9%	0.0	0.0%	95.2%
85–89	0.0	0.0%	100.0%	1.1	5.6%	94.4%	1.1	2.4%	97.6%
90–94	0.0	0.0%	100.0%	0.0	0.0%	94.4%	0.0	0.0%	97.6%
95–99	0.0	0.0%	100.0%	0.0	0.0%	94.4%	0.0	0.0%	97.6%
100–104	0.0	0.0%	100.0%	0.0	0.0%	94.4%	0.0	0.0%	97.6%
Missing	0.0	0.0%	100.0%	1.1	5.6%	100.0%	1.1	2.4%	100.0%
Total	**27.0**	**100.0%**	**100.0%**	**20.3**	**100.0%**	**100.0%**	**47.3**	**100.0%**	**100.0%**

Source: ADF&G Division of Subsistence and UAF household survey, 2012.

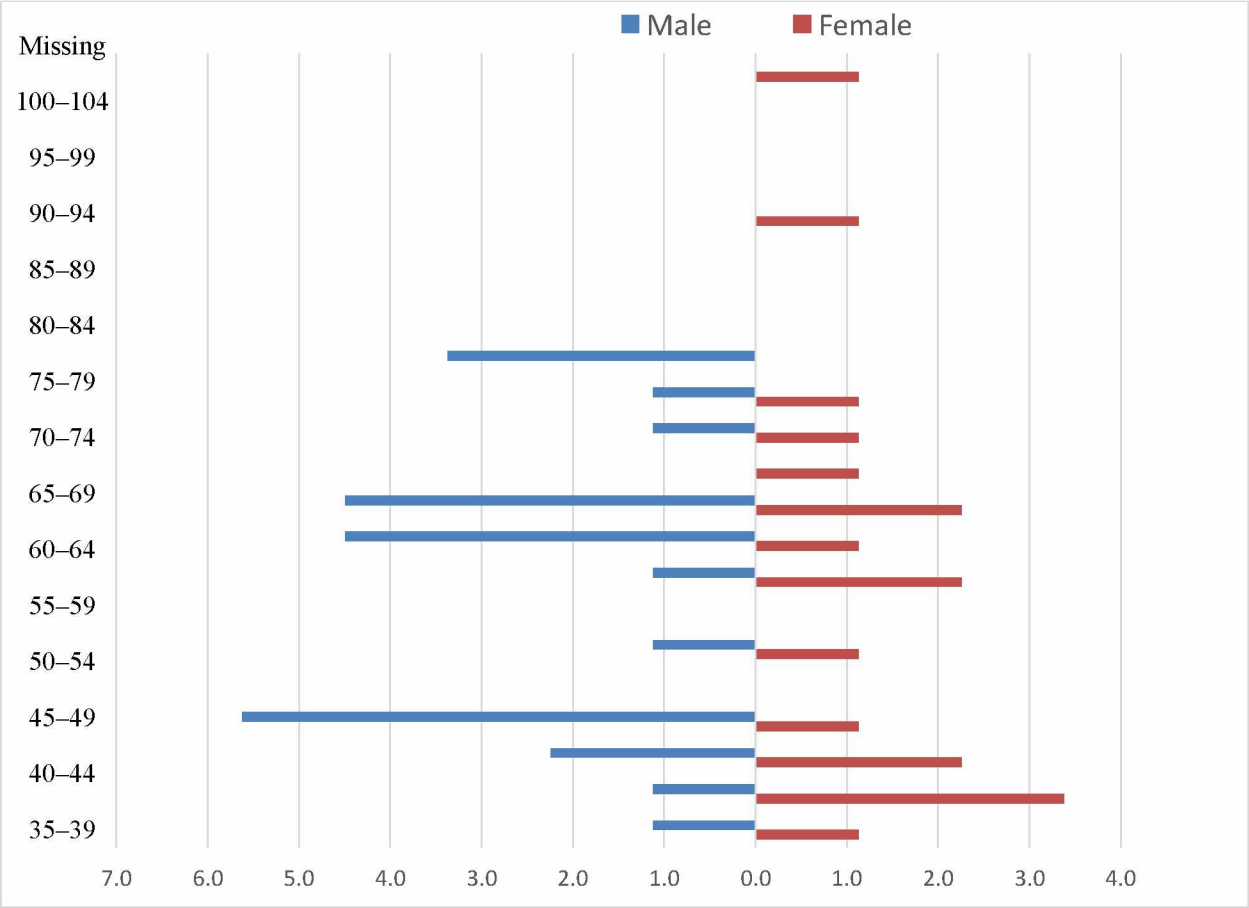

Figure 2-4. Population profile of Chenega Bay, 2011

Kokhanok is a predominantly Central-Yup'ik community located in the Bristol Bay watershed. Residents of Kokhanok travel each year down the Kvichak River to Bristol Bay to participate in the commercial fishery (Holen 2009a; Holen 2009b; Krieg, et al. 2009; Krieg, et al. 2005). Since the late 1990s several household have left the commercial fishery due to low salmon prices and in 2005 only 16% of residents participated in the Bristol Bay fishery (Holen 2009a; Krieg, et al. 2009). Salmon are an important part of the diet. The most recent comprehensive survey occurred in 2006 for the 2005 study year. In 2005, salmon comprised 74% of a total harvest of 680 pounds per capita (Krieg, et al. 2009). Residents are

concerned about salmon habitat as it is an important resource that meets their subsistence needs and continues to provide jobs in the Bristol Bay fishery for some households. This community is located in a watershed that could be affected by the proposed Pebble Project, a copper, gold and molybdenum mine that if developed could be the largest open pit mine in the world (PLP 2009).

During the study year, Kokhanok had 47 households with an estimated population of 133 residents, of which an estimated 92% were Alaska Native (Table 2-1). The mean household size was 3 and the mean age was 34 years. For Kokhanok there was a large age cohort for youth, as well as 20-34 year olds for both males and females. There was also a large age cohort between ages 45 to 54 for both males and females (Table 2-3; Figure 2-5).

Table 2-3. Population profile, Kokhanok, 2011

	Male			Female			Total		
Age	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage
0–4	8.7	14.0%	14.0%	5.5	7.7%	7.7%	14.2	10.7%	10.7%
5–9	2.2	3.5%	17.5%	4.4	6.2%	13.8%	6.6	4.9%	15.6%
10–14	6.6	10.5%	28.1%	1.1	1.5%	15.4%	7.7	5.7%	21.3%
15–19	3.3	5.3%	33.3%	7.7	10.8%	26.2%	10.9	8.2%	29.5%
20–24	2.2	3.5%	36.8%	6.6	9.2%	35.4%	8.7	6.6%	36.1%
25–29	6.6	10.5%	47.4%	10.9	15.4%	50.8%	17.5	13.1%	49.2%
30–34	2.2	3.5%	50.9%	5.5	7.7%	58.5%	7.7	5.7%	54.9%
35–39	5.5	8.8%	59.6%	0.0	0.0%	58.5%	5.5	4.1%	59.0%
40–44	1.1	1.8%	61.4%	0.0	0.0%	58.5%	1.1	0.8%	59.8%
45–49	8.7	14.0%	75.4%	4.4	6.2%	64.6%	13.1	9.8%	69.7%
50–54	5.5	8.8%	84.2%	8.7	12.3%	76.9%	14.2	10.7%	80.3%
55–59	2.2	3.5%	87.7%	5.5	7.7%	84.6%	7.7	5.7%	86.1%
60–64	5.5	8.8%	96.5%	1.1	1.5%	86.2%	6.6	4.9%	91.0%
65–69	1.1	1.8%	98.2%	1.1	1.5%	87.7%	2.2	1.6%	92.6%
70–74	0.0	0.0%	98.2%	3.3	4.6%	92.3%	3.3	2.5%	95.1%
75–79	0.0	0.0%	98.2%	3.3	4.6%	96.9%	3.3	2.5%	97.5%
80–84	0.0	0.0%	98.2%	1.1	1.5%	98.5%	1.1	0.8%	98.4%
85–89	0.0	0.0%	98.2%	0.0	0.0%	98.5%	0.0	0.0%	98.4%
90–94	0.0	0.0%	98.2%	0.0	0.0%	98.5%	0.0	0.0%	98.4%
95–99	0.0	0.0%	98.2%	0.0	0.0%	98.5%	0.0	0.0%	98.4%
100–104	0.0	0.0%	98.2%	0.0	0.0%	98.5%	0.0	0.0%	98.4%
Missing	1.1	1.8%	100.0%	1.1	1.5%	100.0%	2.2	1.6%	100.0%
Total	62.3	**100.0%**	**100.0%**	71.0	**100.0%**	**100.0%**	**133.3**	**100.0%**	**100.0%**

Source: ADF&G Division of Subsistence & UAF household survey, 2012.

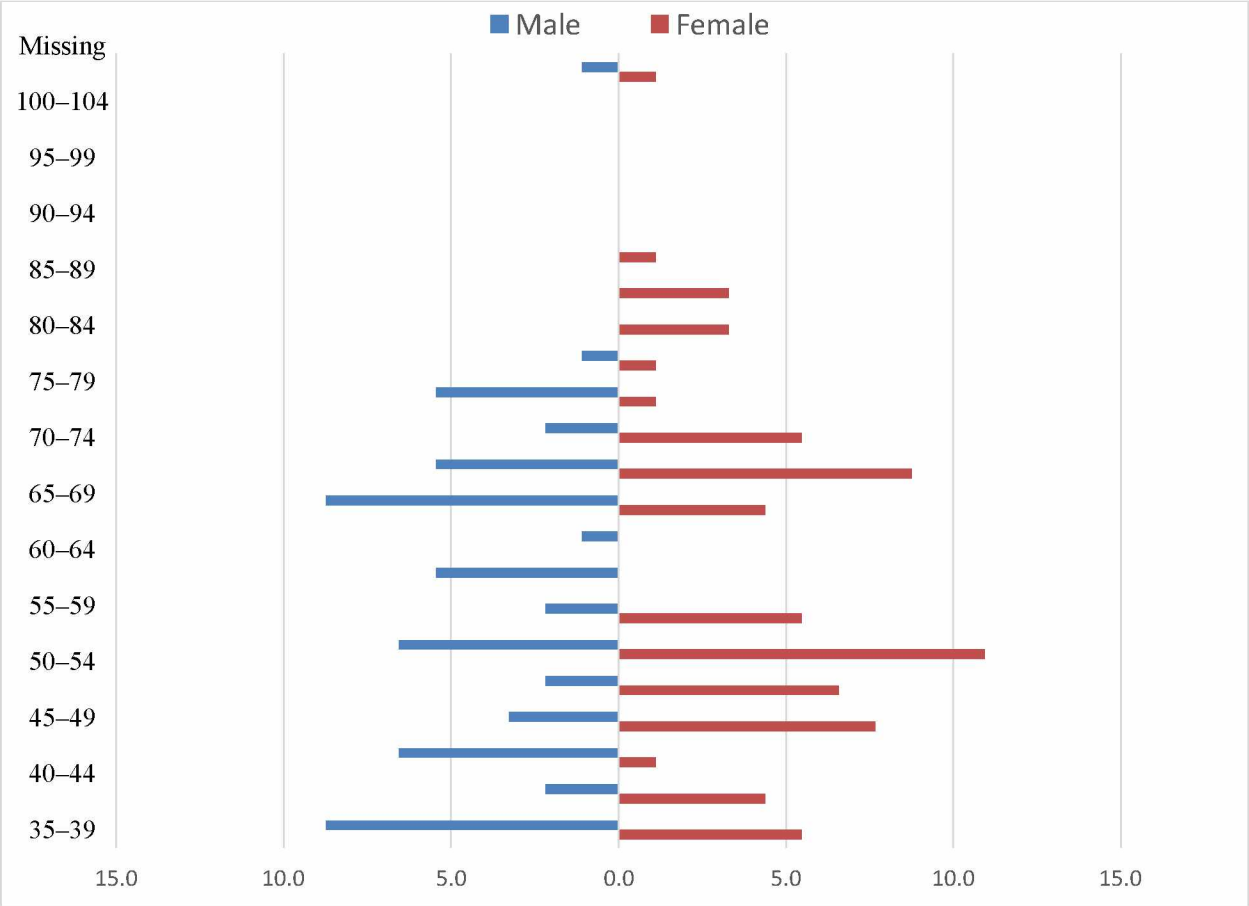

Figure 2-5. Population profile of Kokhanok, 2011

Tyonek is a mainly Dena'ina Athabaskan community located on the western shore of upper Cook Inlet (Stanek, et al. 2006; Stanek, et al. 2007). Salmon, especially Chinook salmon which are a unique subsistence resource in Southcentral Alaska where most people think of them as trophy fish, are used by the community to demonstrate their dependence on the subsistence and commercial fishery (Fall 1989). Fishing for Chinook salmon was prohibited in 1964 due to a decline in Chinook salmon stocks in Cook Inlet. This prohibition was agreed upon by the community of Tyonek as they were concerned by the decline of their traditional resource. In the late 1970s Chinook salmon stocks recovered. In 1978, after

the Alaska Legislature established a priority for subsistence, the Dena'ina of Tyonek sought to reestablish their traditional Chinook salmon fishery. Their request was denied, yet they eventually won the right to their traditional fishery after four Tyonek elders filed suit in Alaska Superior Court (Fall 1989).

Salmon comprised 69% of the total per capita harvest of 217 pounds per person in 2006 (Stanek, et al. 2007). In addition to the subsistence salmon fishery, Tyonek residents also have a long history of commercial fishing in Cook Inlet that goes back to the 1880s. In 2006, 17% of the community was involved in the commercial fishery yet it brought in only 4% of the total community income from employment (Stanek, et al. 2007). Besides the commercial fishery, residents also guide sport fishermen who travel to Tyonek to fish in the Chuitna River for Chinook and coho salmon providing additional income for residents. Tyonek has seen a steady out-migration as residents have moved to urban centers in Alaska (ADLWD 2015; Fall, et al. 1983; Stanek, et al. 2007).

During the 2011 study year, Tyonek had 63 households with an estimated population of 153 residents, of which 97% were Alaska Native (Table 2-1). The mean household size was 2 and the mean age was 31 years. Tyonek showed a large age cohort for youth under the age of 19, especially the age cohort for both males and females of 10-14. There is a large age cohort of females between the ages of 25-39 who are raising children on their own or with extended family (Table 2-4; Figure 2-6). Tyonek has an active Boys and Girls Club where kids can go after school while their parents work, especially their mothers who may be raising the kids on their own. Figure 2-7 shows a general population trend for the past 10 years and Figure 2-8 shows the composition of harvest based on the most recent comprehensive harvest assessment for each community (Fall, et al. 2006a; Krieg, et al. 2009; Stanek, et al. 2007).

Table 2-4. Population profile, Tyonek, 2011

	Male			Female			Total		
Age	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage
0–4	11.6	15.9%	15.9%	3.3	4.2%	4.2%	14.9	9.8%	9.8%
5–9	6.6	9.1%	25.0%	5.0	6.3%	10.4%	11.6	7.6%	17.4%
10–14	9.9	13.6%	38.6%	11.6	14.6%	25.0%	21.6	14.1%	31.5%
15–19	3.3	4.5%	43.2%	6.6	8.3%	33.3%	9.9	6.5%	38.0%
20–24	3.3	4.5%	47.7%	3.3	4.2%	37.5%	6.6	4.3%	42.4%
25–29	1.7	2.3%	50.0%	3.3	4.2%	41.7%	5.0	3.3%	45.7%
30–34	1.7	2.3%	52.3%	13.3	16.7%	58.3%	14.9	9.8%	55.4%
35–39	0.0	0.0%	52.3%	8.3	10.4%	68.8%	8.3	5.4%	60.9%
40–44	5.0	6.8%	59.1%	3.3	4.2%	72.9%	8.3	5.4%	66.3%
45–49	6.6	9.1%	68.2%	5.0	6.3%	79.2%	11.6	7.6%	73.9%
50–54	8.3	11.4%	79.5%	3.3	4.2%	83.3%	11.6	7.6%	81.5%
55–59	5.0	6.8%	86.4%	8.3	10.4%	93.8%	13.3	8.7%	90.2%
60–64	3.3	4.5%	90.9%	0.0	0.0%	93.8%	3.3	2.2%	92.4%
65–69	3.3	4.5%	95.5%	0.0	0.0%	93.8%	3.3	2.2%	94.6%
70–74	0.0	0.0%	95.5%	1.7	2.1%	95.8%	1.7	1.1%	95.7%
75–79	0.0	0.0%	95.5%	0.0	0.0%	95.8%	0.0	0.0%	95.7%
80–84	1.7	2.3%	97.7%	0.0	0.0%	95.8%	1.7	1.1%	96.7%
85–89	0.0	0.0%	97.7%	0.0	0.0%	95.8%	0.0	0.0%	96.7%
90–94	0.0	0.0%	97.7%	0.0	0.0%	95.8%	0.0	0.0%	96.7%
95–99	0.0	0.0%	97.7%	0.0	0.0%	95.8%	0.0	0.0%	96.7%
100–104	0.0	0.0%	97.7%	0.0	0.0%	95.8%	0.0	0.0%	96.7%
Missing	1.7	2.3%	100.0%	3.3	4.2%	100.0%	5.0	3.3%	100.0%
Total	72.9	**100.0%**	**100.0%**	79.6	**100.0%**	**100.0%**	**152.5**	**100.0%**	**100.0%**

Source: ADF&G Division of Subsistence & UAF household survey, 2012.

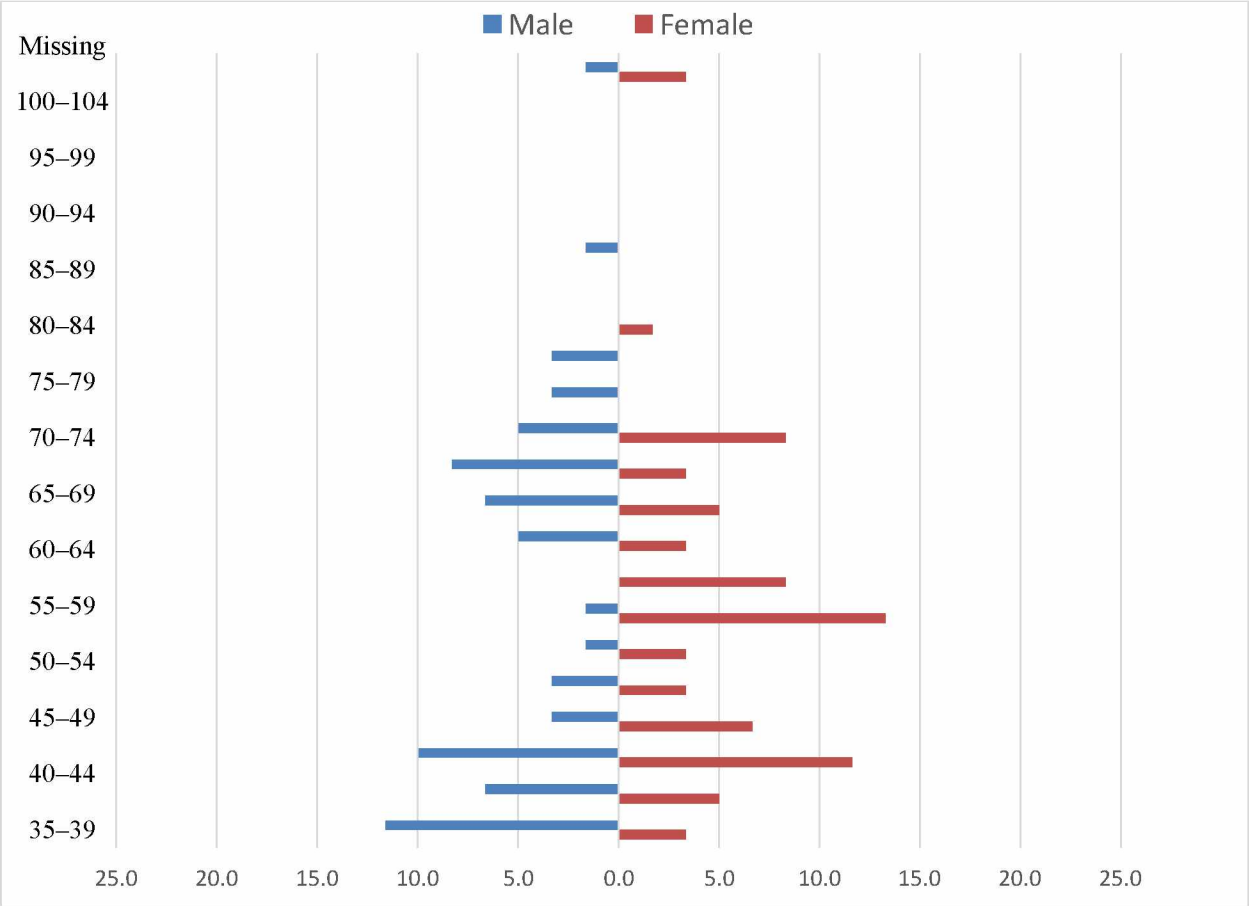

Figure 2-6. Population profile, Tyonek, 2011

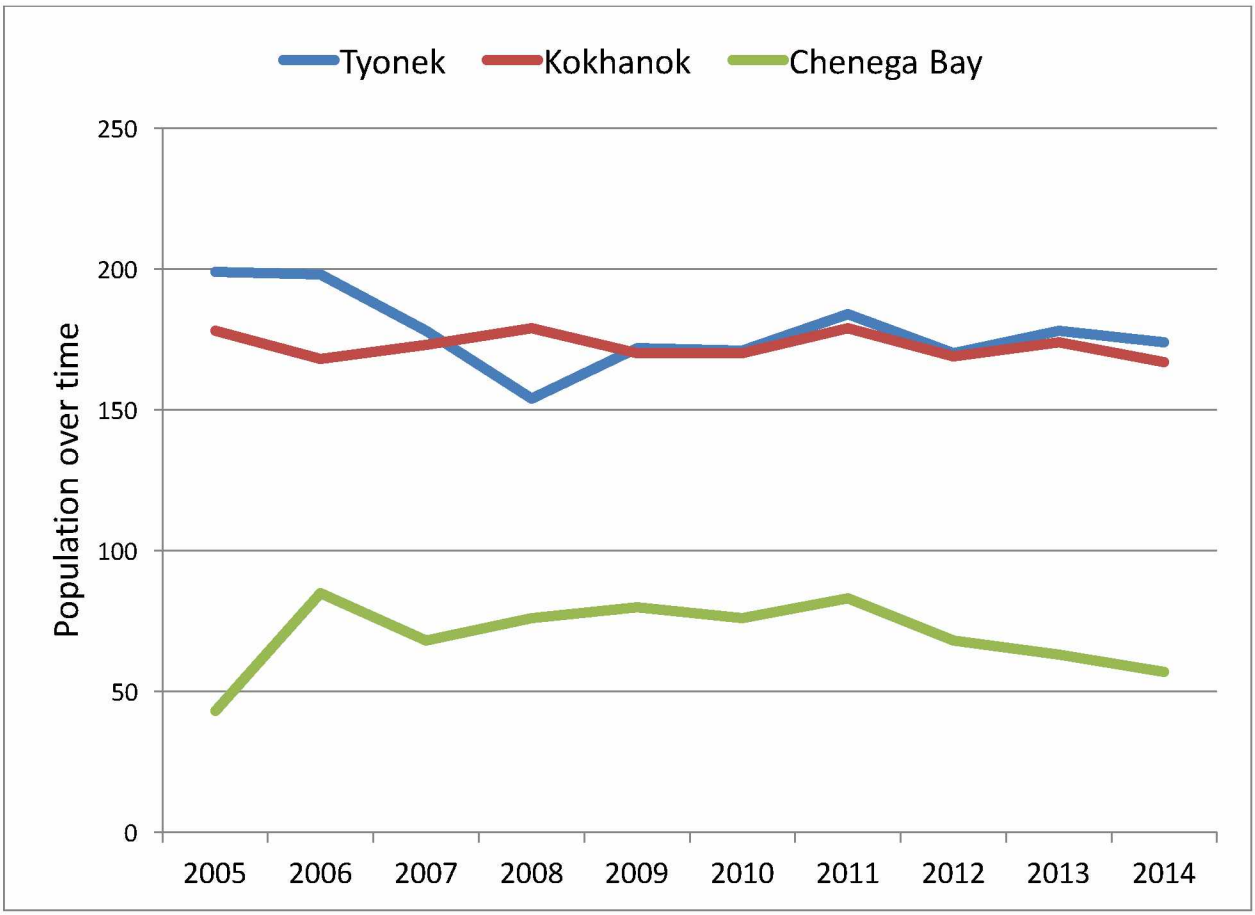

Figure 2-7. Population change over time

Source: (ADLWD 2015)

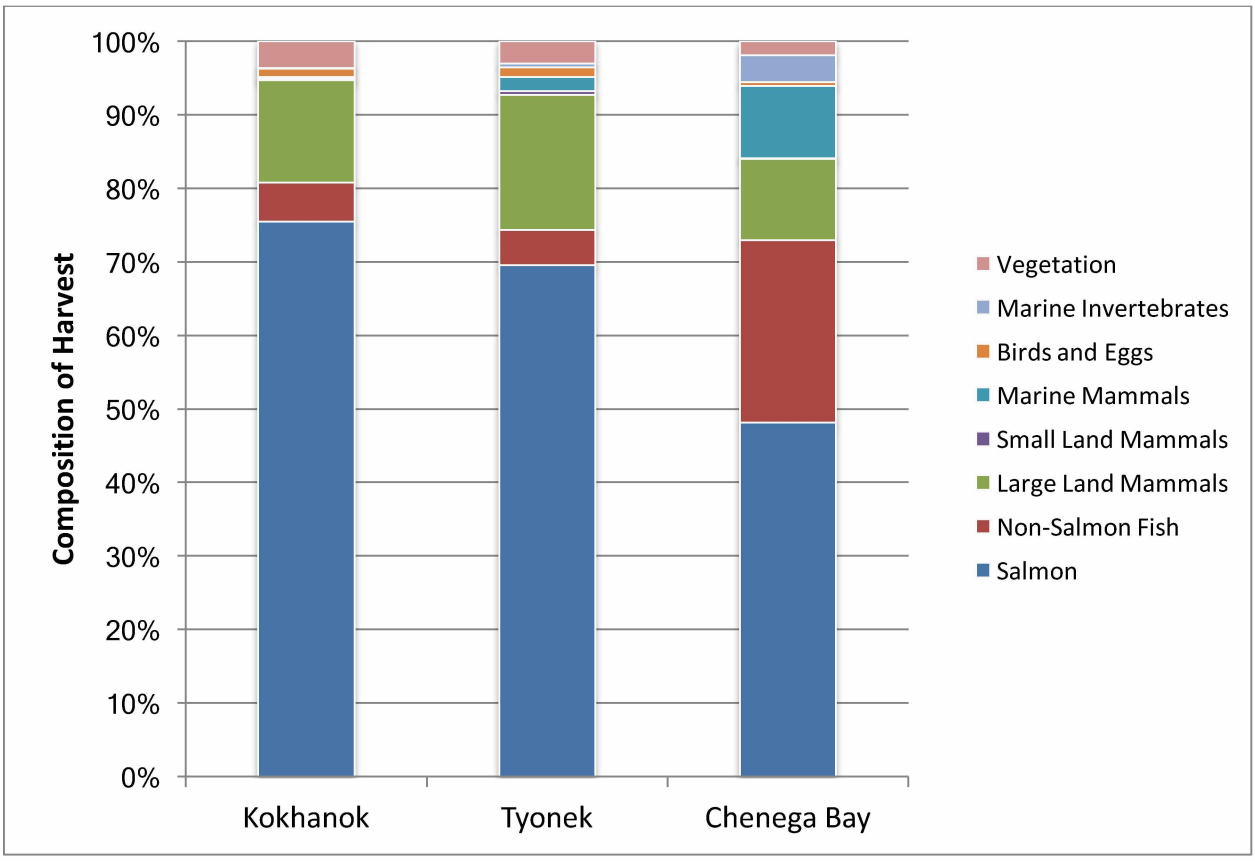

Figure 2-8. Comparison of per capita harvest by resource category

Sources: Fall, et al. 2006a; Krieg, et al. 2009; Stanek, et al. 2007

In all three communities, salmon both for subsistence and commercial fishing form an integral part of life for these fishery dependent communities in coastal Alaska. For example, in the Bristol Bay study community of Kokhanok, commercial fishing provided 16% of the income for the community as a whole in 2005. In terms of jobs, 21% of residents were participating in commercial fishing and 40% of households had at least one family member who fished commercially (Krieg, et al. 2009:71). All three communities are heavily dependent on fishing for jobs, as well as for subsistence. Salmon is also a necessary component of the subsistence economy in these communities to maintain adequate food security. Resident incomes are not as high as urban communities in Alaska. Higher fuel prices have

increased the cost of store bought food, as most food is brought in by plane. Salmon as a subsistence resource is therefore vital in ensuring adequate food security for resident communities.

CONCLUSION

The statistics provided in this chapter that are derived from earlier studies as well as the surveys administered for this study only tell part of the story of how these communities build resilience and adapt to perturbations within complex social-ecological systems. Cultural mechanisms such as the passing on of traditional knowledge, kinship and family ties, and leadership maintain and build resilience within the social system. Subsistence economies and commercial fishing activities in Alaskan coastal communities occurs within complex social-ecological systems that incorporate how humans interact and approach the natural world. These are economies structured by individuals, families, communities, and local organizations. These economies form social and kinship-based networks that ultimately influence the larger social-ecological system. As noted in the introduction, factors such as local leadership, family, and community engagement, or participating in community activities, are factors that also lead to a viable community that ultimately enables the community to adapt to changing circumstances and influence community resilience. This study utilizes a base of quantitative data to understand communities and fisheries, but ultimately this study is ethnographic in nature, focusing on community viability comparable to other studies carried out in coastal Alaska (Carothers 2012; Carothers 2015; Reedy-Maschner 2012; Reedy-Maschner 2010). Although there have been other recent studies that describe social indicators associated with fisheries focusing on quantitative analysis of community resilience (Himes-Cornell and Kasperski 2015; Jepson and Colburn 2013), it is recognized that more in-depth ethnographic analysis is needed (Blount, et al. 2015). This includes an understanding of local-level politics, local knowledge, and the cultural aspects of social-ecological systems.

Chapter 3 – POLITICS AND KNOWLEDGE

LOCAL LEVEL POLITICS

Questions posed in both surveys and key respondent interviews asked respondents about participation in local political organizations and the effectiveness of local organizations in delivering the message of the community in the larger political arena. Questions were also aimed to determine whether extended families are highly influential in the three study communities. The goal of these questions was to identify socio-cultural factors such as kinship based social network and local-level politics that shape contemporary subsistence, cultural, and economic realities.

Collective community identity is often shaped by local politics as internal and external actors negotiate and shape the political landscape of a community and region. Different political structures have different modes for negotiating for power by actors. By power, I mean the ability to influence others and influence the actions of a group. Power is recognized when one or more actors have the ability to dominate others to make group decisions (Lewellen 2003:89). This is especially evident in Alaska, where individuals and often families control local political institutions such as tribal organizations that administer services for communities or village councils that make decisions in small rural communities. In many cases, political power is the result of economic power and influence within the community, as well as across the region. Economics then becomes a motivating factor for controlling local political institutions. Politics is negotiated within the structure of the system.

Kertzer reflected on observations made in several cultures of the role of ritual, symbols, and symbolic action in political situations. Ritual reaffirmed the power structure of a society and the willingness of the population to engage in the political structure, and their social dependence on those structures.

"People have the unsettling habit of willingly, even gladly, dying for causes that oppose their material interests, while vociferously opposing groups that espouse them. It is through symbols that people give meaning to their lives; full understanding of political allegiances and political action hinges on this fact" (Kertzer 1988:8).

A modern Alaskan application of local-level politics research in the North is Dombrowksi's ethnography of local-level politics in Southeast Alaska (Dombrowski 2001:4). Dombrowski illustrated that cultural divisions still exist and continue to play a critical role in the "relationship between all small communities and the larger political economy that surrounds them" (Dombrowski 2001:8). It is an attempt in many ways to look at the social dimensions of Alaska Native culture as a "subculture" that has been allowed to participate the American political economy as "natives" only as long as they continue to maintain their cultural distinctiveness. In so doing they were able to gain special status with benefits like Indian gaming on tribal lands, mineral development that skirts environmental law, or the wholesale timber cutting in Southeast Alaska that would not have been possible on federal or state lands (Dombrowski 2001; Sider 1993). In Southeast Alaska, cutting of timber on ANCSA lands by the corporation created conflict between local residents who relied on forests to provide for hunting and fishing grounds against the group that relied on revenues from the timber sales. The sale of timber off corporation lands was driven by outside market forces as timber was an important commodity for the Southeast Alaska economy. For local residents, the only item they could contribute in this process was their own labor. In order to provide for their families, local residents were forced to participate in the mainstream political economy against their own wish to continue to use the very land they were logging for subsistence (Dombrowski 2001:21).

In Southeast Alaska, as in other regions of Alaska, families control much of the political power in communities. Families are loosely affiliated kin, or those that have aligned themselves with a particular extended kin group. Families are "ad hoc organizations, loosely structured by notions of kinship and extended kin ties. They can shrink and grow, and can emerge from nowhere as situations, opportunities, and problems arise" (Dombrowski 2001:46-47).

Traditional control of resources was once the domain of the clan and house group, corporate structures whose members share matrilineal kinship. The highest-ranking male exercised the power in the house (Langdon 1989:309-310). During the American period companies and the government refused to recognize the claims and property and legitimacy of the clan or house leader. (Langdon 1989:317). It wasn't until the passage of ANCSA that fee-simple title to lands was returned to the Tlingit but by this time traditional systems of resource management had long since been lost (Langdon 1989:325). Today, different types of power structures found in communities may include at the local-level a chief, or series of chiefs, a traditional, village, or IRA council, and city and city council. Many of these organizations are dominated by particular families who often hold leadership roles, and this translates into social status within the community. Particular families then control the politics and decisions that influence the economy of the community.

Large families dominate village politics and this is true in any area of rural Alaska especially where significant power can be wielded to further resource development projects. Families are highly stratified structures and each member of the family may have very different needs, hopes, and expectations. Families can therefore gain and expel individuals and households as those that wield political and economic power strive to guide their membership towards a goal.

Patronage is a very important component of exercising political and economic power at the local level and applies explicitly to local control of fisheries when the ability to enter a fishery, through limited entry, is in itself a commodity to be controlled locally. Southeast Alaskan fisheries especially are an excellent example of fisheries politics due to the complexity of the region, history of colonization by outside fisheries interests, multiple gear types competing for access to rich resources, complex regulations that are the outcome of this competition, as well as the year-round access to different species to fish. Competition in the commercial fishery can be fierce. It's not uncommon to observe a fishing association attempt to influence the decisions made at an Alaska Board of Fisheries meeting by influencing board members and fisheries managers (giving them their first-class seats on flights, buying them dinner, etc.) or squashing dissention by other gear types such as trollers, drift gill netters, and even subsistence fishers. I observed this at the 2012 and 2015 Board of Fisheries meetings in Southeast Alaska.

In the 1970s in many parts of Alaska, and especially in Southeast Alaska, large fishing vessels that were crewed by families began to disappear and family power shifted to the ability to deliver patronage jobs. Family power was once organized in Southeast Alaska around traditional clans. Clans once controlled entire salmon stocks and clans were identified with particular salmon streams (Langdon 1989:306). Families therefore had to engage in the commercial fishery alongside other Alaska residents especially after the implementation of the limited entry system in 1975 which gave permits to those who could demonstrate an economic dependence and past participation in commercial fishing (Langdon 1989:326). Families controlled the capital necessary to finance boats which further solidified the power of influential families in local communities as the ability to fish in the form of a permit became a commodity.

As a result of the decline in the local fishing industry and the addition of a growing state government from oil revenues, state and local government jobs in communities became more important as the economy of the State of Alaska grew. Local government spending and employment in rural communities tripled in size between the 1970s and 1990s while the population of these areas has remained flat (Dombrowski 2001:59). This change in economics and employment is not only observed in Southeast Alaska. Southeast Alaska, being closer to the capital of territorial Alaska, as well as the somewhat colonial infrastructure headquartered in Seattle, experienced some of these complex issues early on. Other parts of Alaska experienced these issues such as the Inupiat on the North Slope whose economy, way of life, and subsequent local political structure was transformed by the discovery of oil at Prudhoe Bay. In Southwest Alaska, politics usually relates to fisheries in some manner. Today Southwest Alaska communities are also grappling with the discovery of major mineral deposits at the headwaters of the Bristol Bay fishery. The potential for a large mine so close to salmon spawning streams has opened up a dialogue about the future of this region, an economy and way of life shaped for over a hundred years by a commercial fishery and a future with a potential of high paying mining jobs. Likewise, Southeast Alaska families often control local political institutions, and in many cases political power is the result of similar economic opportunities available in the community.

Based on observations while conducting research in the Bristol Bay region of Southwest Alaska between 2002 and 2015, I have seen this economic and political discourse play out with regard to subsistence. Subsistence discourse can be observed at the local level in the communities where the research takes place, and at meetings where decisions regarding subsistence opportunities are made. As noted earlier the subsistence way of life is greatly important for economics and food security in rural Alaska and it has become a symbol of rural identity in Alaska and a demonstration of the right to land and wild resources

by rural people. However, often subsistence takes place outside the boundaries of lands directly controlled by rural communities in Alaska. Therefore, the development of political discourse in the North, and especially as it relates to indigenous society, depends on the ability of indigenous or aboriginal communities to "enlighten and persuade outsiders about the character and meaning, in aboriginal terms, of their relationship to homelands and waters" (Scott 2001:7).

The politics of development has also become a mainstream discourse that can be observed on the individual and family level, as well as that of community. Communities in many locations in the North, especially in areas that are the homeland of traditional cultures, formulate their collective identity around symbols. Political action therefore, often is displayed and formed around some tangible symbol of indigenous and rural identity, displaying a right to a traditional resource (Holen 2004). In the North these symbols could include rural and indigenous activities such as hunting and fishing, relating traditional knowledge and generational use of the land, indigenous actions such as land claims and aboriginal title to lands, and wild resources important in subsistence activities such as caribou, moose, whales, walrus, or even fish (Schuurman 2001:389-390). In Southwest Alaska the most common symbol is salmon, especially the bright sockeye that migrate into the rivers and streams of Bristol Bay in the millions. Salmon in Southwest Alaska has become a symbol of a fishery that to local residents and other interested groups has become threatened by a proposed copper and gold mine development called the Pebble Project. The proposed project will be located near Iliamna Lake at the headwaters of the Koktuli River, a river that flows into the Nushagak River, one of the major systems and spawning grounds of the Bristol Bay fishery.

Collective community identity, and community resistance to a proposed development project, such as the Pebble Project is then shaped by internal politics and the position of an individual, family, or

community on the development of the Pebble Mine. Views are mixed and while conducting research in the area in 2007 I was told that if you ask 20 people their opinion about the proposed project you would get 30 answers. The Pebble Project is a mineral deposit in an advanced exploration phase near Frying Pan Lake, which is located close to the community of Iliamna and Newhalen on Iliamna Lake, Alaska's largest freshwater lake. The mineral deposit includes gold, copper, and molybdenum. Northern Dynasty Mines Inc. (NDM) of Vancouver, Canada, the project operator, began environmental baseline studies in 2004 to gather information needed for a feasibility study and applications for federal and state permits (NDM 2005). In 2007, with the exploratory phase of the project well under way, NDM partnered with Anglo-American PLC, a mine operating company, to form the Pebble Limited Partnership (PLP) (PLP 2009).

The local non-profit association, the Bristol Bay Native Association (BBNA), formed around the time of ANCSA today represents 31 tribes in the Bristol Bay region including the study community of Kokhanok, as well as the Chignik area communities that are included as comparison communities (BBNA 2009). BBNA focuses attention on the social and community economic services of local residents while the for-profit corporation, the Bristol Bay Native Corporation (BBNC), focuses on economic development of the region as a whole (BBNA 2009).

As stated in their mission statement, BBNA is supposed to act as a unified voice in the region and has favored protecting commercial and subsistence fisheries. However, some communities within the BBNA compact do not agree with the public positions of BBNA. For example, the Aleknagik Traditional Council (ATC) in 2005 signed a resolution supporting the Pebble Project (ATC 2005). Aleknagik stated that they are frustrated by the lack of jobs in the area. In their resolution, they say that "tribal members who attempt to remain home are not being hired by multiple lodge owners who are located in the Aleknagik

Lake System" (ATC 2005). Lack of employment seems to be the motivator behind their decision to support at least the idea of the project for reasons such as the concern of the community of the "out-migration of young tribal members of Aleknagik who leave the village to find long term jobs" and "this new project could offer jobs, lower the cost of energy, and provide cheaper transportation to the region" (ATC 2005). In 2006, a year after the ATC signed their resolution supporting the idea of the project, the board of directors of BBNA signed a resolution opposing all large-scale mining in the Bristol Bay region until studies unequivocally prove there will be no net loss to subsistence, commercial, and sport use (BBNA 2006). In 2013, a consortium of tribes formed to advocate for the protection of the lands and waters of Bristol Bay from mining. This advocacy group, called the United Tribes of Bristol Bay, includes 14 of the 31 tribal governments in the Bristol Bay region. This includes Aleknagik, which as noted above at one time favored economic development (UTBB 2017).

Salmon forms the backbone of both the traditional subsistence economy and the wage labor economy as many residents harvest salmon for subsistence and participate in commercial fishing. In the BBNA resolution they state that "world salmon markets have turned their focus from farmed salmon to wild salmon as a preferred choice because of environmental and health concerns with farmed salmon; this trend may be undercut if mining causes pollution of our pristine waters" (BBNA 2006). The BBNC also reiterated that their future lies with salmon, not mining (Bluemink 2009). According to the corporation's chief executive Jason Metrokin, "Though the corporation is not directly involved in Bristol Bay's fishing industry, fish remain its highest priority. A large portion of our shareholders are Bristol Bay (fishing) permit holders" (Bluemink 2009).

Sport fishing in the area is a big business as the result of the productive salmon streams and abundant stocks of nonsalmon fish species such as rainbow trout and grayling. For example, streams such as

Lower Talarik Creek, the headwaters of which stretches into Frying Pan Lake at the mine site, harbor some of the largest rainbow trout in the world (Fall, et al. 2006b). Sport fishermen prize rainbow trout as a trophy fish. Partnerships with local businesses with financial resources, such as sport fishing lodges, are important for local residents to fight the media war. Village governments such as the Nondalton Tribal Council do not have the funds to pay for opposition to the mine, which consists of anti-Pebble hats, t-shirts, and bumper stickers that have become prolific in Alaska. Several residents have dedicated all their time to fighting the mine and they need travel funds to attend meetings to voice their opposition. A local lodge owner, Bob Gillam, who owns a capital management company in Anchorage (and a nearby sport fishing lodge), spent over $2 million to pay for lobbying against the Pebble mine. The local residents form the face of the opposition, while funding comes from local sport fishing interests. Both local residents and sport fishermen have an interest in salmon fishing that has been and continues to be the commercial and subsistence base of the economy for generations.

Local residents, as the face of the opposition, demonstrate their reliance on salmon as a symbolic display of their traditional knowledge of the environment and dependence on wild resources, especially salmon. It is their way to demonstrate that they have been in the area from time immemorial and it is their land, their waters, and their fish, and they choose fish over gold. As the BBNA ad campaign reiterates "It's always been" (Trademarks 2016).

Local Knowledge

Harvesting salmon is a fundamental activity in the subsistence way of life in southern Alaska and is as much about food security as it is about cultural traditions and family. Questions were asked in this study, especially in the key respondent interviews, about sharing and passing down knowledge and

traditions. To better understand how salmon is intertwined in the lives of coastal communities we need to review how local knowledge and local practices become embedded in culture, and how harvesting practices are largely embedded in complex social mechanisms. Local knowledge or traditional ecological knowledge (TEK) is a worldview that incorporates cultural values, ethics, and the basic norms of society, or what would be considered right conduct in human-environmental relations (Berkes, et al. 2000:1256).

This section reviews different perceptions of human-environmental relations. It also looks at the broader more holistic concepts of the interaction of culture and environment and finally describes how human-environmental relations fit within the larger context of social-ecological systems. According to Usher "from a Western scientific perspective, TEK includes empirical facts or associations based on observation and experience, explanations of fact, a culturally specific way of organizing and understanding information, a set of values, and - in a very broad sense - cultural norms about how to do things" (Usher 2000:186).

TEK goes beyond the study of local and indigenous knowledge of resources and the environment. Concepts and knowledge of the environment cannot be separated from the culture of an indigenous people. TEK is embedded in the culture and cannot be separated. A hunter, when asked to define TEK, will just as likely talk about some subject such as social organization (Nadasdy 1999). TEK held by a group is indicative of both their culture and how they compartmentalize environmental knowledge.

Animals, like their human kin, are often part of the culture and social worlds of a group. For example, to the Frazier River Salish in Canada, salmon are people giving themselves to humans. To the Salish, it is proper to return the bones and skins of salmon to the streams so the salmon people can put their coats back on and return again (Anderson 1994). In the community of Nondalton, near the study community of Kokhanok, large quantities of sockeye salmon are harvested for subsistence. The fish remain in the

water after the harvest and any unused parts of the salmon such as the viscera, heads, and backbones are immediately returned to the water from the cutting tables. Residents note that it's proper to return what is not used to the river (Fall, et al. 2010). Western scientists might also concur with the ecological value of a traditional practice such as this, but only because it is good for the enrichment of the gravel beds where salmon lay their eggs and provides nutrients for young salmon. When it comes to the degradation of the environment and the destruction of salmon streams, the Salish see this as a cosmological problem as well as a human problem.

Fienup-Riordon examined the worldview of the Yup'ik people in Southwestern Alaska regarding hunting and fishing (Fienup-Riordon 1990). The Yup'ik harvest fish on the Yukon and Kuskokwim Rivers in both the subsistence and commercial fisheries and are in competition with sport fishers. To the Yup'ik it is disrespectful to insult fish. The Yup'ik view tagging and examination of fish by biologists as disrespectful (this is similar to an observation by Berkes, which will be discussed later). In their worldview, fish give themselves to the human, just as land animals do. The person who catches a fish must accept it and treat its remains properly. Fish and humans are part of the same community, each dependent on social relations; therefore, the relationship is reciprocal. If the humans do not follow the rules embedded in their culture, the fish may not return to them again. To the Yup'ik, it is disrespectful for a biologist or sport fisherman to catch a fish and release it; this action disrupts the reciprocal relationship between humans and fish. In addition, Yup'ik do not see fish as a limited resource. Only the ability of the fisherman to obtain the resource is limited. In their view, there are plenty of fish. If the fisher does not treat the fish properly, the fish will not put themselves in the way of the person so that they may be taken. Social relations then are built upon the cultural construction of ways of being embedded within the world; social relations between humans and non-human beings as well as between individuals and

the group. There are proscribed rules as to how one acts in both circumstances to ensure the collective survival of both actors, human and non-human.

Dwelling on the other hand is the perspective that TEK is not some remnant of past knowledge about the environment, but a living knowledge based on the contemporary actions and activities one engages in, and how one perceives the world through engagement with the social and natural worlds. This concept of dwelling envisions that "apprehending the world is not a matter of construction but of engagement, not of building but of dwelling, not of making a view of the world, but of taking the view in it" (Ingold 2000:42). It's about building that memory in the here and now.

This approach can be useful in looking at fishing communities, in that the action of catching, processing, and putting away fish has more significance for modern fishing peoples than just providing food for the winter. Harvesting salmon occurs each year around the same time and is an annual activity that is consistent from year to year, generation to generation. Animal populations may grow in numbers and decline over time, and hunting patterns are not consistent from year to year. Harvesting salmon ties one to the seasons and to tradition. As one respondent told me during a salmon ethnography project in Nondalton in 2007, if she misses a year at fish camp she feels like there is something wrong for the entire year, which can only be resolved by returning to camp the following year (Fall, et al. 2010). Further, to fish with one's family in this communal cultural setting demonstrates a continuation of a cultural activity that is as much about modern identity and belonging to the group and the land in the present, as it is an action that links one to the past. Further these actions can maintain resilience in communities through the continuity of knowledge gained by participating each year in a ritual activity. As members of a community continue to fish each year they maintain long held practices, improve on those practices, and pass those practices on to youth who then gain skills.

In Southwest Alaska, the Dena'ina Athabaskan people of Nondalton return each year for several weeks to inhabit fish camps five minutes by boat from their community. They do this not just to fill their pantries with canned salmon. It is also to relive a cultural tradition, pass those traditions on to youth, and to reaffirm the importance salmon plays in the cultural tradition (Holen 2009:307). Not only is this continued reaffirmation of fishing important, it is the passing down of the cultural tradition and knowledge of fishing to the next generation. What is especially salient here is that "TEK is not just knowledge of the past, but also knowledge of the present" (Menzies and Butler 2006:8). They dwell here to honor the past, embrace the present, and learn skills important for the future.

When people have lived in one location for many years they form a repetitive interaction with the environment in which they dwell. It is in this that we form a basis for the understanding of what truly is the crux of TEK; it is a repetitive use of an environment building upon generations of accumulated knowledge of best practices in a specific locale. This includes a deep felt spiritual or emotional connection to those places as the knowledge that one's ancestors walked down that same trail, fished from that same stream, and pulled water from that same lake. It is in a sense the collective memory of one's group that is felt in each interaction with the environment. This way of being is about the social relations of the group as well as the functional way of dwelling in the environment.

The Intersection of Local Level Politics and TEK: Social-Ecological Systems

In today's world, development and sale of natural resources, especially in remote areas that indigenous peoples have inhabited for generations, is sold to the public as a way to benefit these local populations by integrating goods and services at the local subsistence level with the larger national and global economy. This idea is based on the western notion of ownership of resources, ignoring local

mechanisms embedded in cultural and social systems. The unraveling of these traditional mechanisms leaves local populations vulnerable to environmental and market shifts. In addition, the management of resources that benefit all users of the commons is often predicated on the notion of individual competition between users. This competition could lead to overexploitation of a resource; resources once managed for the benefit of all, now ignore cultural systems that once managed resources through systems of "social sanction, redistribution, inclusion, and exclusion" (Robbins 2004:45).

Environmental change, and the dominant hegemony of how a society recognizes (or doesn't recognize) environmental change and ecological conditions are products of the political process at the local, state, and global level (Robbins 2004:11). In my own research, I have often focused on examining how an agency and the public process makes decisions to allocate natural resources, whether it's caribou or fish, for the benefit of all human users of State of Alaska's public trust resources. This ignores that the focus should be on all actors of the system, both human and non-human. It also ignores the examination of who we are as a collective body of social and culturally constructed institutions, and what basic assumptions can be made as to the ideals behind the decision-making process through an examination of how the hegemonic discourse came to be.

Alaska has not one fishery but many due to its size and breadth of wild resources, and each stock provides unique challenges of management. Nevertheless, the State has a policy that ties them all together. Management directives for fisheries are based on maximum use of the resource to benefit all Alaskans, while putting conservation of the resource first. In addition, Alaska has both small community-based fisheries that interact with large industrial fisheries throughout the diverse state, which without careful management could lead to the degradation of fisheries viewed as common property resources (Mansfield 2010).

Although there are small-scale fisheries in Alaska, there is a hegemonic discourse that defines how resources are to be used for the benefit of the economy of the State of Alaska with an emphasis on capital intensive fisheries. Alaska's economy is tied to the national and global economy as its rich fisheries have become important commodities due to overfishing of once abundant stocks of cod in Eastern North America and salmon fisheries on the Northwest Coast. Within the larger global economy, it is important to understand the history of development of Alaska fisheries and how much of the harvest today is destined as high quality product for the benefit of the wealthy global North (Mansfield 2010:89).

The allocation of resources and underlying environmental problems, that are sometimes the outcome of overexploitation of the resources, are dealt with as systemic problems in which the behavior of the system is complex and unpredictable, and causes are usually multivariate. Ecological relationships are nonlinear in nature, cross-scale in space and time, and have an evolutionary character (Holling et al. 1998 *In* Berkes 1999).

According to Berkes and others, social and ecological systems are linked and the barrier between the two systems is arbitrary; humans are simply a part of the ecological system and the delineation of the two is culturally constructed. Both human and natural systems are complex and many of the resource and environmental issues and problems that are the cause of the investigation of social ecological systems (SES) are the result of the interaction of the two systems with each other (Berkes, et al. 2003a:2-3). The necessity of studying SES is controversial. Just as mainstream ecological studies ignore the role of humans in the environment, so do social science studies ignore the role of the environment (Berkes, et al. 2003a:9). A conceptual model for an SES should include an ecological system "intricately linked with and affected by one or more aspects of a social system" (Andries, et al. 2004:3).

One of the overarching needs of moving from an ecological perspective based on TEK research to a social-ecological systems perspective has to do with management of humans in the natural system; human politics cloud the system. In the 1980s to 1990s much of the discussion of management by social scientists, especially those involved in fisheries management, centered on the discourse of common property resources (Berkes, et al. 2003b; Berkes, et al. 2001; Dinnocenzo, et al. 2010; Finney, et al. 2000) and fisheries management (Pinkerton 1994; Pinkerton and Weinstein 1995; Tobias 2009). Numerous case studies documented local conservation efforts and management of resources such as how lobster fishers in Maine regulate access to their own fishery. For example, Maine lobster fishers have devised their own system of dividing the commons on a social level, ignoring government intervention. Areas are regulated by one of two systems depending on their spatial orientation, resource abundance, and private property ownership of land. The perimeter-defended resources are those with resources controlled by a single group or "gang" and are near a homeport or private land. The second is the nucleated areas, which are those that are not spatially orientated to land and may be shared by more than one group (Acheson 1987).

Much of the emphasis on researching community centered common property resource management focused on small-scale fisheries in Maine, Mexico, Newfoundland, as well as some larger fisheries such as those found in Iceland and Alaska (Dyer and McGoodwin 1994; Palsson 1994). Both ecological and human social fishing systems have "similar responses to the combined impacts of environmental and global socioeconomic stresses on marine social-ecological systems" (Perry, et al. 2011:442). In addition, fishers interacting with each other within a defined ecological system affect one another's activities, which also has a feedback loop in affecting the ecological system as well (Andries, et al. 2004). The current focus has shifted from a paradigm of the commons to social-ecological system.

In marine environments, such systems have biophysical and human (including cultural, management, economic, and socio-political) components that are highly inter-connected and interactive. Changes in marine ecosystems have impacts on, and consequences for, the human communities that depend on these systems, but how human communities then respond to these changes can have reciprocal impacts on marine ecosystems (Perry and Ommer 2010:739).

Anthropologists in the field of fisheries management are looking at the culture and traditions of fishing, particularly the social norms and group decision making in small-scale fisheries (Hilborn 2007:287). This perspective of social-ecological systems expands into other areas such as the management of wetlands (Olsson, et al. 2004) and Arctic ecosystems (Berkes and Jolly 2001). Many of these systems that researchers focus on are coastal regions. "Coastal regions are typically multi-use, multi-stakeholder systems calling for integrated approaches to manage trade-offs and conflicts in these socio-ecological systems" (Hammer, et al. 2003:527-528).

Describing social-ecological systems through the lens of resilience can be done in any location by understanding the dynamic interaction between nature and society through "case studies situated in particular places and culture" (Berkes and Jolly 2001). These are case studies of how individuals, households, and communities modify their rules of interaction with the environment to ensure their livelihoods.

Holling and others in the 1990s began to see management as an attempt to manage by reaction to changes in animal and fish populations instead of an ecosystem approach which attempts to learn to manage by change (Holling 1973; Holling 1996). This included an approach focusing on understanding the role that small groups play in an ecosystem approach. The idea is that to understand the ecosystem you must also understand those institutions and people associated with the ecosystem; how they are

organized and behave. This "implies that uncertainty and surprise is part of the game and you need to be prepared for it and learn to live with it" (Folke 2006:255).

Using the lens of resilience is one promising tool for analyzing adaptive change towards sustainability because it provides a way for analyzing how to maintain stability in the face of change. According to Berkes "a resilient social-ecological system, which can buffer a great deal of change or disturbance, is synonymous with ecological, economic, and social sustainability" (Berkes, et al. 2003a:15). This is due to the fact that managing social-ecological systems for long-term, sustainable outcomes is difficult as the researcher cannot forecast the future in any meaningful way as there are too many uncertainties (Berkes, et al. 2001). This means that instead of focusing on controlling the system, managers and users of the system must focus on living within the system (Walker, et al. 2002). This can be done by "analyzing resilience and enabling people to discover how the SES in which they live might be made more resilient to shocks, and more able to renew and reorganize itself should larger shocks occur" (Walker, et al. 2002). A shock to the system does not always mean a negative change for users. When managing for a resilient social-ecological system, "disturbance has the potential to create opportunity for doing new things, for innovation and for development. In vulnerable systems, even small disturbances may cause dramatic social consequences" (Folke 2006:253). If managers understand the system, then they and users can jointly plan for disturbances and adapt in a way that influences the resilience of the system. These responses can also come from actors within the system. Responses to disruptions to the system including ecological, social, economic, and political changes, that make the system untenable at the statewide or national level, could be influenced by the social resilience of a system at the community level (Broderstad and Eythorsson 2014; Robards and Greenberg 2007).

There are three critical concepts in a social-ecological system: resilience, adaptability, and transformability (Walker, et al. 2004). Resilience is often defined as the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks. "Adaptability is the capacity of actors in a system to influence resilience" (Walker, et al. 2004:3). In a SES, this amounts to the capacity of humans to manage resilience as human actions dominate in an SES; adaptability of a system is mainly a function of the social component—the individuals and groups acting to manage the system. "Transformability is the capacity to create a fundamentally new system when ecological, economic, or social conditions make the existing system untenable" (Walker, et al. 2004:3).

"Resilience is an important element of how societies adapt to externally imposed change, such as global environmental change" (Berkes, et al. 2003a:14). Environmental changes are especially seen in areas such as the North where residents depend highly on the natural environment for their subsistence needs as well as on abundant fisheries to ensure their livelihood. "The adaptive capacity of all levels of society is constrained by the resilience of their institutions and the natural systems on which they depend. The greater their resilience, the greater is their ability to absorb shocks and perturbations and adapt to change" (Berkes, et al. 2003a:14). For management, this is especially germane as managers need to understand the patterns of fishers and what stocks they target for example. A fishery that diversifies targeted species will be more resilient to shocks to the system based on this diversification (Berkes, et al. 2001:22; Schindler, et al. 2010).

Social-ecological systems build resilience through the experiences that come from disruptions to the system. This provides the system with a memory of an event both within the ecological system, and within the memory of those that dwell within that ecological system. Both the social and ecological

systems adapt to the changing circumstances of the situation. This means that SES must have memory, both physical memory in the ecological system and memory within the social system. "The resilience perspective shifts policies from those that aspire to control change in systems assumed to be stable, to managing the capacity of social-ecological systems to cope with, adapt to, and shape change" (Berkes, et al. 2003a; Folke 2006).

Understanding all the components of a system in a more holistic nature is important for planning for disturbances to the system as the removal of any one part of the system can have lasting consequences and cause disruption. For example, "it is not the number of species per se that help sustain an ecosystem in a certain state or domain of attraction, but rather the existence of species groupings, or functional groups (e.g. predators, herbivores, pollinators, decomposers, water flow modifiers, nutrient transporters) with different and often overlapping characteristics in relation to physical processes" (Folke 2006:258). This is relevant to fisheries, but also to other types of ecosystems as well. Kofinas and others looked at the ecosystem services provided by the boreal forest environment of northern Alaska and the interaction of the social system and the ecological subsystem, particularly habitat that is useful for a single species, moose (Kofinas, et al. 2010:1349). Habitat for moose is being affected by environmental change and this in turn affects the communities that rely on this one herbivore species for a great deal of their subsistence needs. They found that humans manage vulnerability and resilience through "sharing networks [which] buffer both individuals and communities from fluctuations in harvest success and reflect indigenous worldviews of the human-environmental reciprocity" (Kofinas, et al. 2010:1355). These communities must also contend with complex management structures that they themselves are invested in through representation on various advisory committees, as well as the politics of dealing with outside sport hunters and predators such as bears and wolves.

This perspective of understanding an ecosystem in a more holistic manner is relevant to the incorporation of humans within the environment as communities are part of the system and must "withstand external shocks to their social infrastructure, such as environmental variability or social, economic and political upheaval" (Folke 2006:259). This inclusion of the social in ecological systems creates an understanding of resilient systems. The resilient approach provides a forum for generating interdisciplinary collaboration on issues of fundamental importance for governing and managing a transition toward sustainable development (Folke 2006:260).

In Alaska, there have been recent examples of studies that use social indicator studies for assessing vulnerability of rural communities that are heavily dependent on wild resources to climate change, social, global economics, and other factors that could be disruptive to the resilience of a community (Himes-Cornell and Kasperski 2015; Robards and Greenberg 2007). "Social indicators are proxies for the concepts of interest in fishing communities, based on rank position in established indices and substituting for social and economic impacts of fishery management plans. Fishery dependence is a measure of a community's economic dependence on fisheries in relation to other income and livelihood bases in a community" (Blount, et al. 2015:2). However, these studies look at communities from a macro level measuring a suite of factors such as ecological, social, economic, politics, as well as physical effects like climate change. What is needd is further analysis at the individual community level to address unique ways communities address challenges to their long-term viability. Robards and Greenberg come closer to examining the ecological, economic, and social resilience at a smaller scale by developing a conceptual model of Pacific salmon social-ecological systems. They propose to do this by conceptualizing the dynamics of the social-ecological system and analyzing the dynamics of the social-

ecological system resulting from potential management actions that may impact the resilience or long-term viability of the system (Robards and Greenberg 2007:18).

Examining social-ecological marine systems is one venue for investigating the synthesis of human systems and ecosystems. Issues such as fisheries in a global market have emphasized the interconnected nature of the world (Berkes, et al. 2001:19). However, most fisheries that involve local communities are relatively small-scale and when examining social-ecological systems in the global context it is imperative to remember that marine systems at the local level exist in a variety of conditions and one blanket policy will not work for all systems. Additionally, social-indicator analysis does not provide for embedded social factors such as leadership, subsistence sharing networks, or other factors that maintain community viability. Analysis and governance strategies should take into consideration plans that are flexible at the community level for a wide range of marine social-ecological systems in a world of global uncertainty (Perry and Ommer 2010:741; Perry, et al. 2011; Robards and Greenberg 2007). Any analysis should also integrate an ethnographic approach to understand these community level factors. Humans within these social-ecological systems act primarily at the local-level, as they are concerned with ecosystems immediately surrounding them in the environment where they dwell.

Introduction to Part II: Research Findings

In chapters one and two the background that I have provided so far is built upon the collection of quantitative data I along with others cited in this study collected over the past 15 years as part of my research for the Alaska Department of Fish and Game. As such, in exploring the topic of fishery dependent communities for this project I collected additional quantitative data to examine the

economic and subsistence landscape of coastal communities in Alaska. Included in this are survey questions that attempted to understand community-initiated adaptive strategies to maintain resilience, and the fundamental question of why fishing is important for subsistence, culture, and economy. Although providing a good base, survey data and statistics alone cannot tell the story of salmon and their intertwined lives with people. Through the next few chapters I will explore the questions that led to this line of inquiry: 1) what are community perceptions of the intersection of commercial and subsistence fishing in rural coastal communities in Alaska, 2) how do the economics of a fishery shape attitudes and perceptions of community viability, and 3) how can we measure resilience of fishery dependent communities in Alaska? Through the next three chapters I will explore the importance of subsistence, economy, and the transmission of traditions by residents of fishing communities in the cultural landscape in which they dwell.

Chapter 4 – SUBSISTENCE

To follow-up on surveys that were administered in Kokhanok in Spring 2012, I returned to the community in the fall of that year to conduct key respondent interviews and present to the community the results of the survey to get their feedback. While in the community I spent a day at the local K-12 school giving presentations to several classes on what I was in the community to study, findings from the survey, a general discussion about culture, and the work I had done in the community over the past 10 years. During a presentation to a 4-6 grade combined class I asked the students why salmon was important to them. One student responded that it provided most of their food for the year so that they had money to buy other items. It was such a simple answer, yet embodied much about what I was learning through this project. Economic reasons seemed to be a big part of why residents were harvesting salmon for subsistence and participating in the commercial salmon fishery. During the survey, I asked residents of the three study communities how important salmon was to the local economy in terms of both subsistence and commercial fishing. As noted in Figure 4-1, a majority of residents in all three communities found salmon to be very important. Over the past 10 years I have seen this expressed best by participating at fish camps, especially in Tyonek.

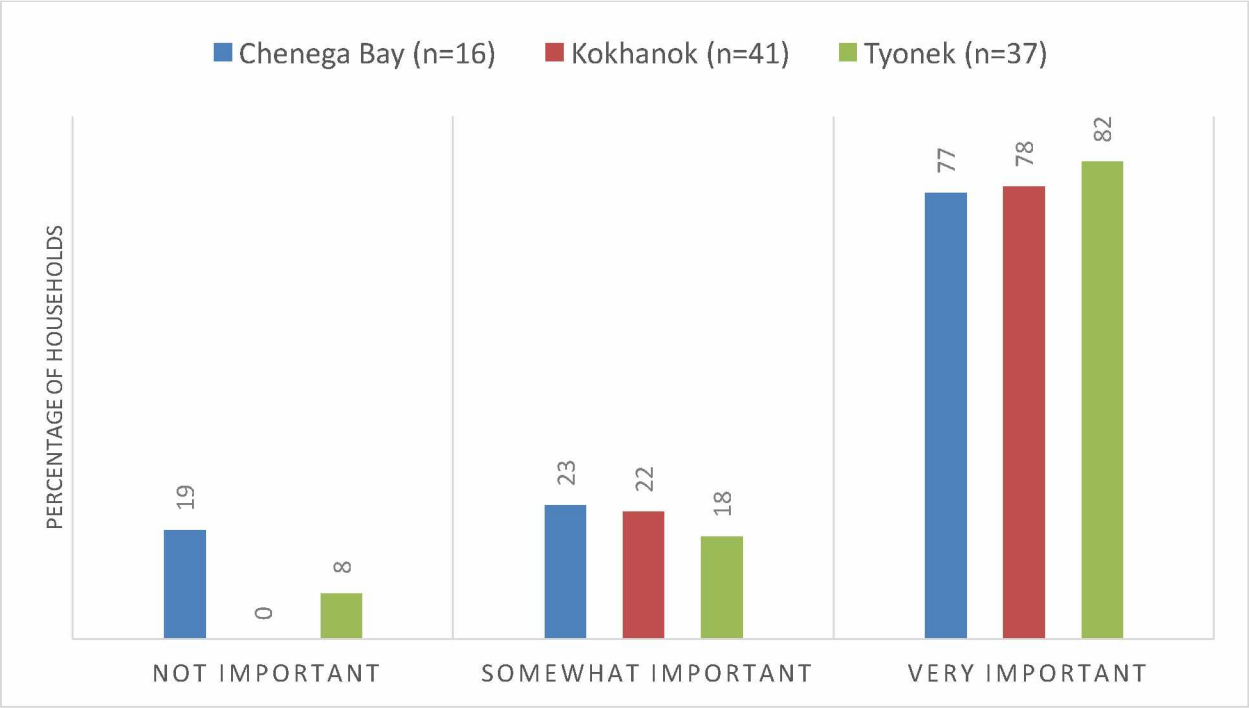

Figure 4-1. Importance of salmon for the local economy

Near the community of Tyonek at Robert's Creek fish camp, there are three cabins occupied by siblings who have been participating in fishing at this site since they were children. Their older brother passed away some years ago and since that time the three have worked together to bring in the harvest at the same location the family has been fishing for multiple generations. For over 10 years I have been traveling down to the fish camp to talk with the family and observe their fishery (Stanek, et al. 2006). No fishing occurs until the matriarch of the camp, Harriet Kauffman, arrives. Harriet tries to come down to the camp from the village in the morning for the early tide and then again after work for the late tide. The salmon migrate close to the shore of West Cook Inlet each spring arriving on the high tide. The fishery opens May 15th each year and residents have three weekly opportunities to fish both tides,

Tuesday, Thursday, and Friday, through mid-June to harvest Chinook salmon, their preferred traditional species.

There are several important reasons why residents prefer Chinook salmon over other species and why proper processing is important. Chinook arrive early in the season, are large, and oily. Processing Chinook with their thick oily meat is different than other species. The meat must be cut in an exact thickness or it will spoil. It is typical in Tyonek, as in other Dena'ina Athabascan communities, for fish camps to be led by a senior woman within an extended family. Without her guidance salmon may not be processed correctly and may spoil, leaving the family without adequate food for the rest of the year. Chinook are, by far, the largest salmon available. They supply a great deal of food, and are harvested and processed efficiently. In terms of time spent fishing and processing, Chinook provide more food per time or energy unit spent than other salmon (Holen and Fall 2011). Chinook are still processed for traditional products, such as balik (strips) and backbones that, at Tyonek, are not produced from other species. Chinook salmon are rich in fat and oil. Nutritionally, and in terms of taste, local harvesters report they are superior to other salmon. Traditional knowledge and skills concerning fishing and processing are predicated on Chinook salmon; techniques especially for processing Chinook are not the same as for other species.

Harriet told me that except for when she went away to Mount Edgecumbe High School—one of Alaska's boarding schools for rural residents—she has lived in Tyonek her entire life and has fished every season. Salmon are important for her household for three reasons: dietary or subsistence, culture, and economic. These three main categories were also expressed in Kokhanok during the survey and interviews. Residents expressed that salmon were important for subsistence, cultural continuity, and economic reasons (Figure 4-2). These are also the three reasons discussed in length by one respondent

in Kokhanok, Renee Zackar, who places a high degree of importance on ensuring that her kids participate in fish camp each summer.

This chapter and the following two are organized in this manner; subsistence, culture, and economics. The beginning of each chapter will provide statistics gathered through surveys for this project as well as surveys in other fishery dependent coastal communities in Alaska that I had administered to complement these three study communities. At several points, additional statistics will be provided from other sources such as the Alaska Commercial Fisheries Entry Commission (CFEC) and findings from studies undertaken by the National Marine Fisheries Service, Alaska Fisheries Science Center (AFSC) will be included in the final discussion as a comparison to these study findings. This provides the basis for understanding each theme. However, each community is unique and only through more qualitative data can the uniqueness and complexity of the importance of fisheries to each community be adequately articulated.

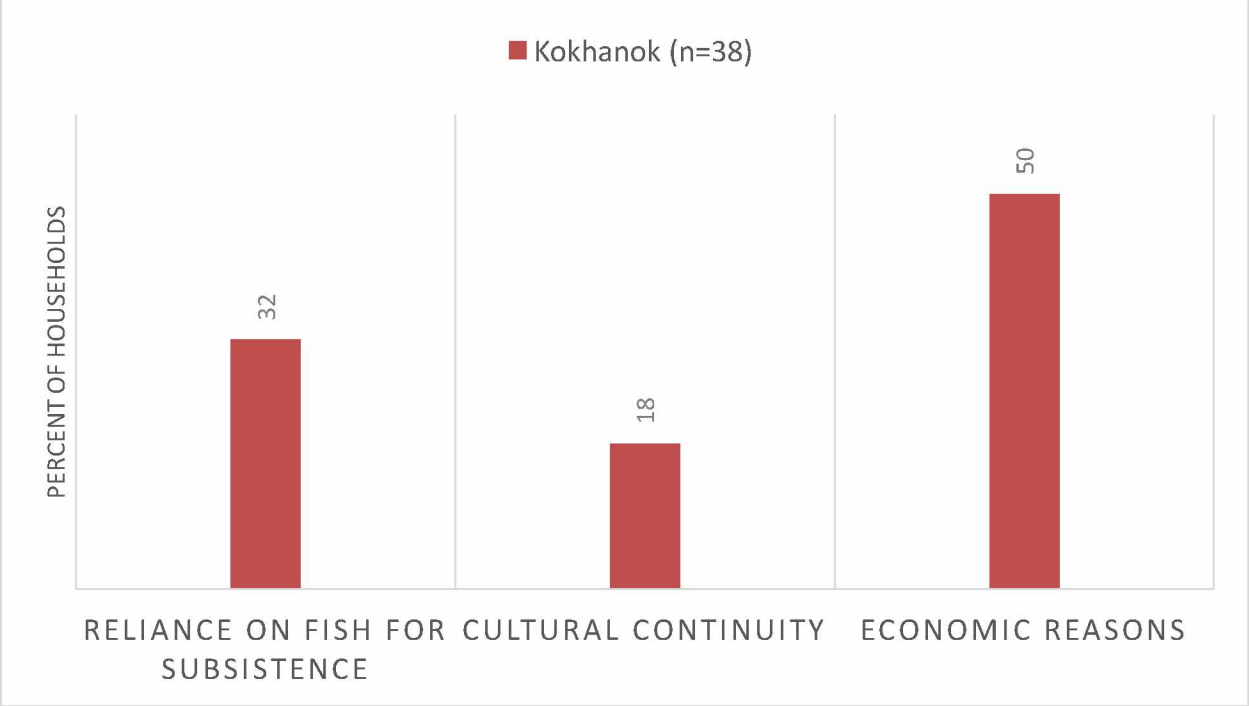

Figure 4-2. Reasons salmon is important for the community, Kokhanok

HARVEST AND SHARING

Salmon is a necessary component of the subsistence economy to maintain adequate food security in many rural Alaskan communities. Resident incomes are not as high as in urban communities in Alaska. Higher fuel prices have recently driven up the cost of store-bought food, as most food is brought in by plane. Salmon as a subsistence resource is therefore vital in ensuring adequate food security for resident communities. During this study, each community showed a high level of individual participation in subsistence fishing. Participation activities include both the harvest of the resource at fishing locations and the processing of salmon. Individual participation in subsistence fishing in each community ranged from 36% in Chenega Bay to 64% in Kokhanok (Table 4-1). More residents in

Chenega Bay (62%) and Kokhanok (67%) processed fish in 2011, while fewer residents in Tyonek (44%) processed fish during that same year. Processing includes cutting up the fish, and in most cases smoking and jarring the salmon. In all three communities, both old and young residents note that younger people are not participating as much in these activities as they did in the past.

Table 4-1. Participation in subsistence fishing activities, 2011

	Chenega Bay	Kokhanok	Tyonek
Total number of people	**47.3**	**133.3**	**152.5**
Salmon			
Fished for			
Number	16.9	85.3	99.5
Percentage	35.7%	63.9%	67.4%
Process			
Number	29.3	89.6	63.0
Percentage	61.9%	67.2%	43.7%

Source ADF&G Division of Subsistence and UAF household survey, 2012.

Tables 4-2, 4-4, and 4-6 show estimated harvest and use of salmon by species for each of the three study communities. The "harvest" category includes resources harvested by any member of the surveyed household during the study year. The "use" category includes all salmon taken, given away, or used by a household, and salmon acquired from other harvesters, either as gifts, by barter or trade, or through fishing partnerships. Differences between harvest and use percentages reflect sharing among households, which results in a wider distribution of salmon. Participation at the household level in fishing for salmon is high in all three communities, around 82%. The tables also show the harvest of salmon in terms of edible weight and the number of individual salmon harvested. As salmon are often harvested by households working together, the mean household harvest is also provided. Tables 4-3, 4-5, and 4-7 show the estimated harvest of salmon by gear type. This shows that harvest in the

subsistence fishery is not the only means for harvesting salmon for home consumption and that residents use a variety of methods including removing salmon from commercial harvests, fishing using gear authorized under subsistence regulations, or by rod and reel under sport fishing regulations. Residents use the most efficient means to harvest salmon to meet their harvesting goals, regardless of what regulatory regime the harvest falls under.

Sharing of salmon includes giving and receiving of both raw and processed salmon between households. This salmon could come from within the community or outside the community. The amount of salmon shared is not part of this study. Sharing does not include salmon that has been cooked for home use to share with guests or salmon that is cooked and shared at a community event.[5]

CHENEGA BAY

In 2011, Chenega Bay residents harvested 1,545 salmon, for a total of 6,459 pounds. The per capita harvest was 137 lb, and the mean household harvest was 359 lb (Table 4-2). Of the total salmon harvest, 37% was sockeye salmon, followed by pink salmon (27%), coho salmon (21%), chum salmon (10%), and Chinook salmon (5%; Figure 4-3). In terms of pounds harvested, an almost even percentage of salmon were harvested using rod and reel gear in the sport fishery (46%) and a subsistence gear (45%), while removals from the commercial fishery accounted for 10% of the harvest (Table 4-3).

[5] Although it is recognized that sharing salmon that is cooked at communal events is important for social and cultural reasons, this activity would be difficult to quantify so has not been included in the survey.

Table 4-2. Estimated harvests and uses of salmon, Chenega Bay, 2011

	Percentage of households					Harvest weight (lb)			Harvest amount			95%
	Use	Attempt	Harvest	Receive	Give		Mean				Mean	confidence
Resource	%	%	%	%	%	Total	househol	Per capita	Total	Unit	household	limit (±)
Salmon	87.5	81.3	81.3	75.0	68.8	6,458.8	358.8	136.7	1,545.2	Ind.	85.8	20.0
Chum Salmon	31.3	25.0	25.0	18.8	25.0	663.3	36.9	14.0	131.6	Ind.	7.3	37.7
Coho Salmon	75.0	68.8	68.8	37.5	56.3	1,329.1	73.8	28.1	198.0	Ind.	11.0	23.0
Chinook Salmon	43.8	43.8	25.0	37.5	18.8	302.3	16.8	6.4	21.4	Ind.	1.2	45.1
Pink Salmon	43.8	43.8	43.8	12.5	25.0	1,729.6	96.1	36.6	658.1	Ind.	36.6	48.5
Sockeye Salmon	87.5	68.8	68.8	68.8	68.8	2,420.5	134.5	51.2	532.7	Ind.	29.6	30.3
Spawnouts	12.5	0.0	0.0	12.5	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.0
Spawning	12.5	0.0	0.0	12.5	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.0
Unknown Salmon	6.3	6.3	6.3	0.0	0.0	14.1	0.8	0.3	3.4	Ind.	0.2	0.0

Source ADF&G and UAF household surveys, 2012.

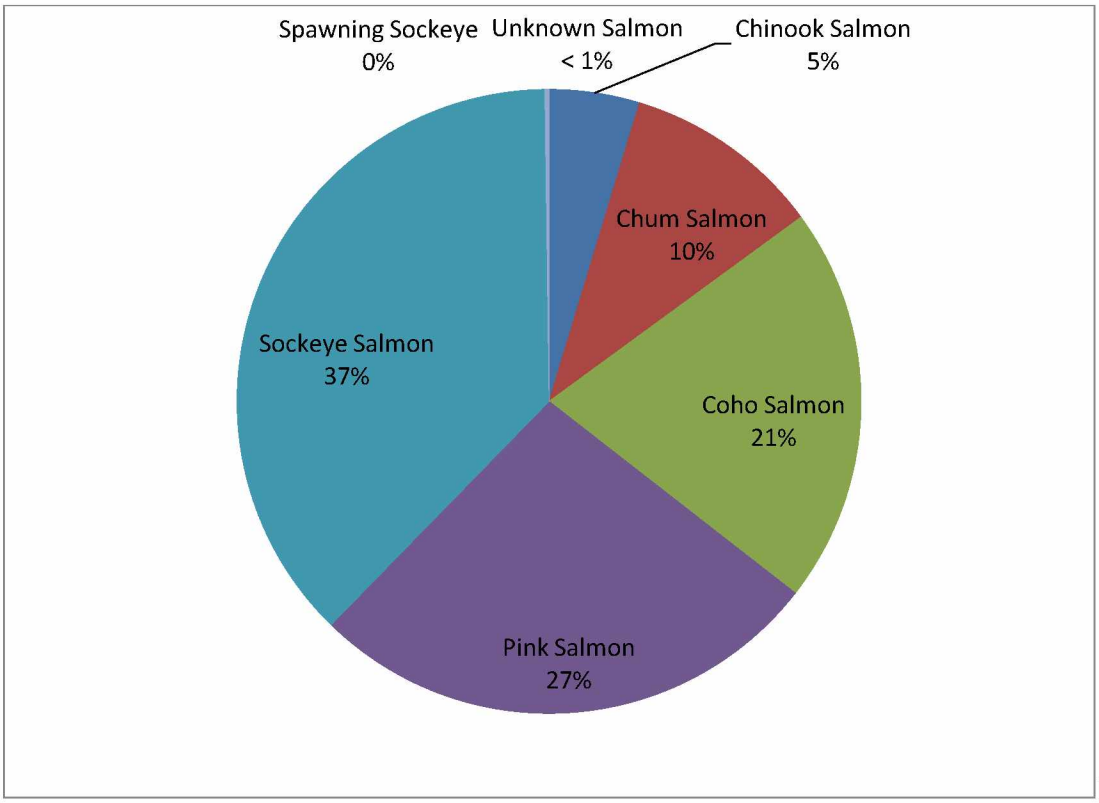

Figure 4-3. Percentage of salmon harvested by weight, Chenega Bay, 2011

Table 4-3. Estimated percentages of salmon harvested by gear type, Chenega Bay, Alaska, 2011

				Subsistence methods									
		Removed from						Subsistence gear,					
	Percentage	commercial catch		Setnet		Seine		any method		Rod and reel		Any method	
Resource	base	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.
Salmon	Gear Type	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	Resource	7.3%	9.7%	34.2%	39.3%	4.0%	5.4%	38.2%	44.8%	54.5%	45.5%	100.0%	100.0%
	Total	7.3%	9.7%	34.2%	39.3%	4.0%	5.4%	38.2%	44.8%	54.5%	45.5%	100.0%	100.0%
Chum Salmon	Gear Type	20.0%	18.0%	5.3%	5.6%	36.4%	32.3%	8.6%	8.8%	6.9%	10.0%	8.5%	10.3%
	Resource	17.1%	17.1%	21.4%	21.4%	17.1%	17.1%	38.5%	38.5%	44.4%	44.4%	100.0%	100.0%
	Total	1.5%	1.8%	1.8%	2.2%	1.5%	1.8%	3.3%	3.9%	3.8%	4.6%	8.5%	10.3%
Coho Salmon	Gear Type	26.0%	31.2%	13.2%	18.4%	36.4%	43.0%	15.6%	21.4%	9.1%	17.5%	12.8%	20.6%
	Resource	14.8%	14.8%	35.2%	35.2%	11.4%	11.4%	46.6%	46.6%	38.6%	38.6%	100.0%	100.0%
	Total	1.9%	3.0%	4.5%	7.2%	1.5%	2.3%	6.0%	9.6%	5.0%	8.0%	12.8%	20.6%
Chinook Salmon	Gear Type	4.0%	10.1%	0.2%	0.6%	5.5%	13.6%	0.8%	2.2%	1.5%	6.0%	1.4%	4.7%
	Resource	21.1%	21.1%	5.3%	5.3%	15.8%	15.8%	21.1%	21.1%	57.9%	57.9%	100.0%	100.0%
	Total	0.3%	1.0%	0.1%	0.2%	0.2%	0.7%	0.3%	1.0%	0.8%	2.7%	1.4%	4.7%
Pink Salmon	Gear Type	0.0%	0.0%	3.6%	2.0%	18.2%	8.4%	5.1%	2.8%	74.5%	56.2%	42.6%	26.8%
	Resource	0.0%	0.0%	2.9%	2.9%	1.7%	1.7%	4.6%	4.6%	95.4%	95.4%	100.0%	100.0%
	Total	0.0%	0.0%	1.2%	0.8%	0.7%	0.5%	2.0%	1.2%	40.6%	25.5%	42.6%	26.8%
Sockeye Salmon	Gear Type	49.0%	39.9%	77.7%	73.4%	1.8%	1.5%	69.7%	64.6%	7.8%	10.2%	34.5%	37.5%
	Resource	10.4%	10.4%	77.0%	77.0%	0.2%	0.2%	77.2%	77.2%	12.4%	12.4%	100.0%	100.0%
	Total	3.6%	3.9%	26.6%	28.9%	0.1%	0.1%	26.6%	28.9%	4.3%	4.6%	34.5%	37.5%
Spawning Sockeye	Gear Type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Unknown Salmon	Gear Type	1.0%	0.7%	0.0%	0.0%	1.8%	1.3%	0.2%	0.2%	0.1%	0.2%	0.2%	0.2%
	Resource	33.3%	33.3%	0.0%	0.0%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	100.0%	100.0%
	Total	0.1%	0.1%	0.0%	0.0%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.2%	0.2%

Source ADF&G Division of Subsistence & UAF household survey, 2012.

Sockeye salmon is the most targeted species of salmon by Chenega Bay residents, and 88% of households reported using sockeye salmon during the study year; 69% of households reported attempting to harvest and harvesting sockeye salmon during that same year (Table 4-2). The total harvest of sockeye salmon was 533 salmon. A majority of the sockeye salmon harvested during the study year were harvested in the subsistence fishery (77%), while rod and reel harvests accounted for 12%, and 10% were commercial removals (Table 4-3). Sharing of sockeye salmon was also high between households with 69% of estimated households giving and receiving the resource (Table 4-2).

Coho salmon were also an important resource in 2011 with an estimated 75% of households reported using coho salmon and 69% attempting to harvest and harvesting the resource (Table 4-2). The total harvest of coho salmon was 198 salmon. The majority (47%) of coho salmon was harvested in the subsistence fishery; of the remaining fish, 39% were caught using rod and reel, and 15% were removed

from commercial catch (Table 4-3). Sharing of coho salmon was also high with 56% reported giving coho and 38% receiving coho.

Pink salmon were important in terms of number of fish harvested (658 salmon). Almost all, 95%, were harvested by rod and reel. Pink salmon were used by 44% of households; sharing and receiving was lower for this species than other species with 25% of households giving away pink salmon and 13% receiving pink salmon. This demonstrates that there is a higher percentage of sharing for species mainly harvested in the subsistence fishery in the community, than those species more often harvested using sport fishing gear. However, residents do share Chinook salmon when they are harvested regardless of gear type although this species only makes up 5% of the harvest in terms of pounds edible weight. In Chenega Bay in 2011, 19% of households reported giving away Chinook salmon and 38% of households reported receiving Chinook salmon (Table 4-2). Chinook salmon often arrive in the spring prior to other pacific salmon species, are sometimes caught during the winter using rod and reel gear while trolling, and are highly valued and shared within a community.

In Chenega Bay in 2011 a majority of the salmon harvested were caught locally, as documented as part of the household harvest survey. Figure 4-4 shows the areas where residents reported fishing for salmon. As shown, most of the harvest was near the community using gill nets in the subsistence fishery and residents also fished for salmon in marine waters using rod and reel in the sport fishery.

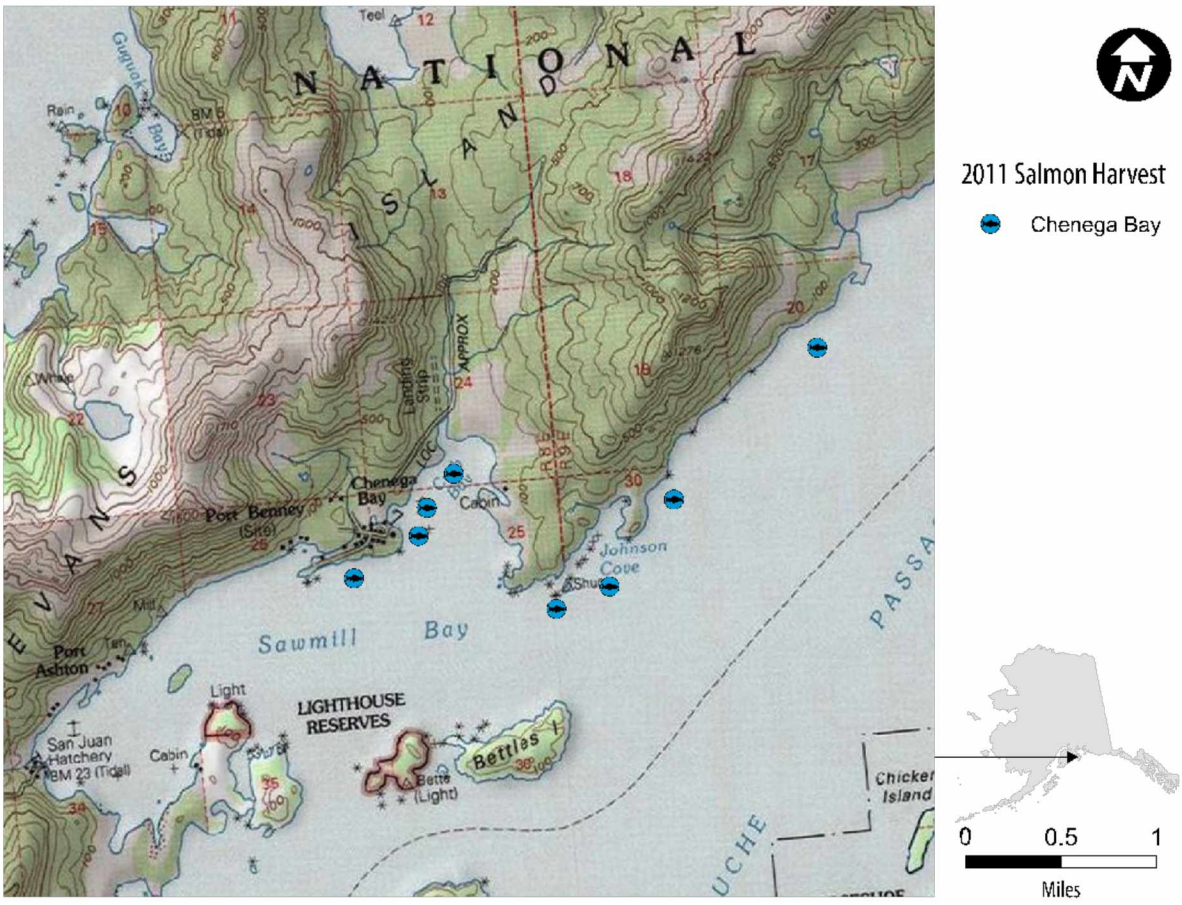

Figure 4-4. Salmon harvest locations, Chenega Bay, 2011

Map by Davin Holen

KOKHANOK

In 2011, Kokhanok residents harvested 13,251 salmon, for a total of 58,077 pounds. The per capita harvest was 436 lb, and the mean household harvest was 1,265 lb (Table 4-3). Of the total salmon harvest, 95% was ocean bright sockeye salmon harvested during the summer months of June and July, followed by 5% spawning sockeye which is harvested usually in October and often referred to as a "fall fish." Coho salmon made up 2% and chum salmon 1% (Figure 4-5). Kokhanok has the highest harvest of

salmon in the Bristol Bay management area (Holen and Lemons 2012) as well as in the State of Alaska (Fall, et al. 2014).

As shown in Table 4-4 and Figure 4-5, sockeye salmon are the most targeted species of salmon by Kokhanok residents, with 98% of households using sockeye salmon and 77% of households harvesting sockeye salmon during the study year (Table 4-4). The total harvest of sockeye salmon was 12,131 salmon. Almost all the sockeye salmon harvested during the study year were harvested in the subsistence fishery (98%), while rod and reel harvests accounted for 2%, and .6% were removed from commercial harvests (Table 4-5). Sharing of sockeye salmon was also high between households with 70% of estimated households both giving and receiving the resource (Table 4-4). Spawning sockeye salmon had a per capita harvest of 23 lb, or 67 lb per household. This was almost entirely harvested in the subsistence fishery (96%) using either a set gill net (38%) or beach seine (58%). Beach seines require a number of fishers to operate and fall fishing is often a community activity with a number of boats and residents participating. The harvest is then shared between a large number of households. In 2011, an estimated 19% of households gave away fall fish while 28% received the resource. Overall 44% of households used spawning sockeye salmon.

Coho salmon were also an important resource in 2011 with an estimated 23% of households using coho salmon and the same percentage attempting to harvest as well as harvesting the resource (Table 4-4). The total harvest of coho salmon was 245 salmon. The majority (80%) of coho salmon was harvested in the subsistence fishery with another 20% harvested by rod and reel (Table 4-5). Rod and reel fishing for coho is a popular late summer activity, usually conducted in August when most of the sockeye harvest has been completed and the salmon have been processed and stored for the winter. This provides fresh fish through the remainder of the summer leaving the processed salmon for winter. The harvest is

small, usually a few salmon caught weekly, and most is for household consumption with little sharing; in the study year, 14% of households gave away coho salmon and 9% received coho salmon (Table 4-4).

Table 4-4. Estimated harvests and uses of salmon, Kokhanok, Alaska, 2011

	Percentage of households					Harvest weight (lb)			Harvest amount			95%
	Use	Attempt	Harvest	Receive	Give		Mean				Mean	confidence
Resource	%	%	%	%	%	Total	household	Per capita	Total	Unit	household	limit (±)
Salmon	97.7	81.4	81.4	74.4	76.7	58,077.2	1,265.1	435.5	13,250.6	Ind.	288.6	10.7
Chum Salmon	9.3	7.0	7.0	2.3	4.7	300.5	6.5	2.3	66.7	Ind.	1.5	42.2
Coho Salmon	23.3	23.3	23.3	9.3	14.0	1,233.4	26.9	9.2	245.1	Ind.	5.3	34.8
Chinook Salmon	34.9	27.9	27.9	18.6	20.9	932.8	20.3	7.0	91.8	Ind.	2.0	35.1
Pink Salmon	9.3	4.7	4.7	4.7	7.0	5.4	0.1	0.0	2.2	Ind.	0.0	57.5
Sockeye Salmon	97.7	76.7	72.1	69.8	69.8	52,516.1	1,144.0	393.8	12,131.2	Ind.	264.3	11.4
Spawnouts	44.2	32.6	23.3	27.9	18.6	3,071.0	66.9	23.0	709.2	Ind.	15.4	27.0
Spawning Sockeye	44.2	32.6	23.3	27.9	18.6	3,071.0	66.9	23.0	709.2	Ind.	15.4	27.0
Unknown Salmon	2.3	2.3	2.3	0.0	2.3	18.1	0.4	0.1	4.4	Ind.	0.1	58.2

Source: ADF&G and UAF household surveys, 2012.

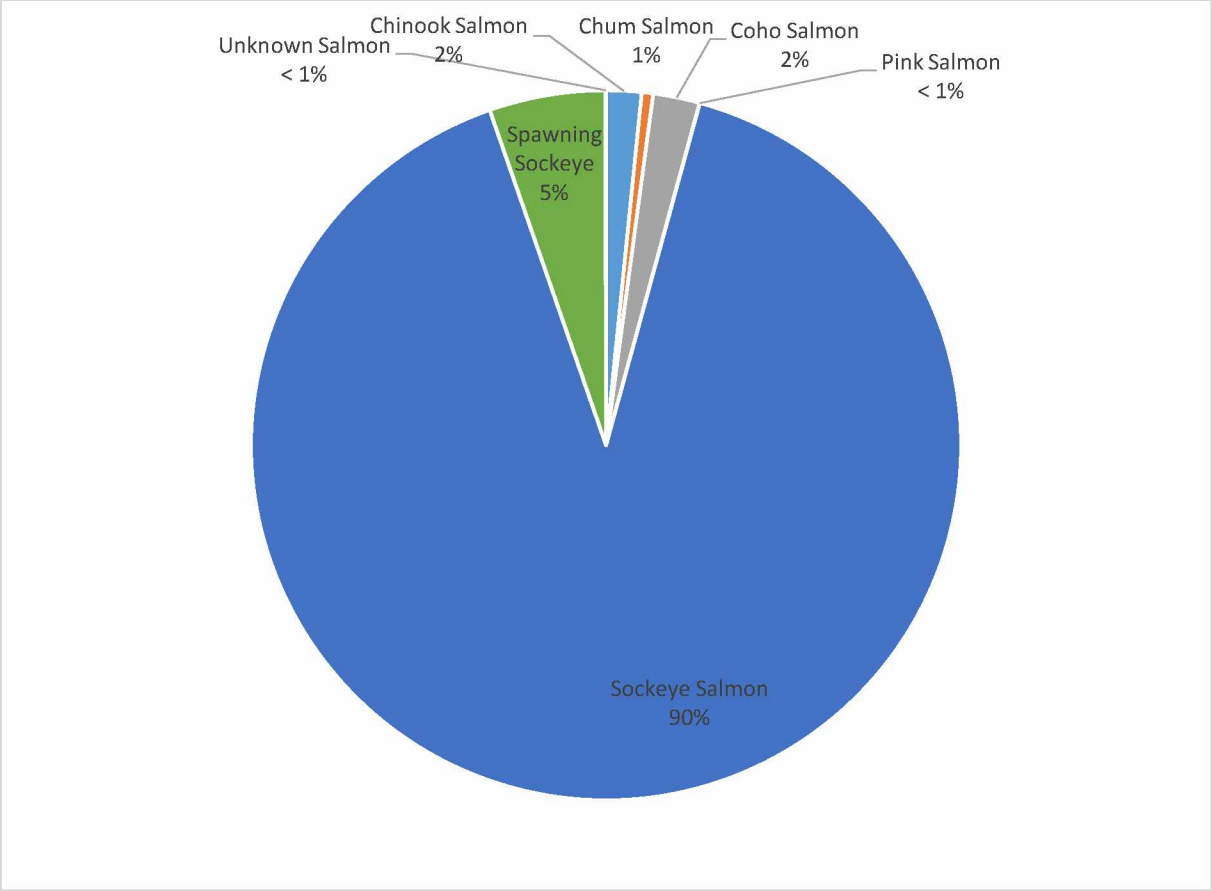

Figure 4-5. Percentage of salmon harvested by weight, Kokhanok, 2011

Table 4-5. Estimated percentages of salmon harvested by gear type, resource, and total nonsalmon fish harvest, Kokhanok, Alaska, 2011

				Subsistence methods									
		Removed from commercial catch		Setnet		Seine		Subsistence gear, any method		Rod and reel		Any method	
Resource	Percentage base	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.
Salmon	Gear Type	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	Resource	0.7%	0.9%	93.2%	93.0%	3.7%	3.7%	96.9%	96.7%	2.4%	2.5%	100.0%	100.0%
	Total	0.7%	0.9%	93.2%	93.0%	3.7%	3.7%	96.9%	96.7%	2.4%	2.5%	100.0%	100.0%
Chum Salmon	Gear Type	0.0%	0.0%	0.5%	0.6%	0.0%	0.0%	0.5%	0.5%	0.0%	0.0%	0.5%	0.5%
	Resource	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	100.0%	100.0%
	Total	0.0%	0.0%	0.5%	0.5%	0.0%	0.0%	0.5%	0.5%	0.0%	0.0%	0.5%	0.5%
Coho Salmon	Gear Type	0.0%	0.0%	1.6%	1.8%	0.4%	0.5%	1.5%	1.8%	15.3%	17.4%	1.8%	2.1%
	Resource	0.0%	0.0%	79.0%	79.0%	0.9%	0.9%	79.9%	79.9%	20.1%	20.1%	100.0%	100.0%
	Total	0.0%	0.0%	1.5%	1.7%	0.0%	0.0%	1.5%	1.7%	0.4%	0.4%	1.8%	2.1%
Chinook Salmon	Gear Type	20.5%	37.7%	0.6%	1.4%	0.0%	0.0%	0.6%	1.3%	0.0%	0.0%	0.7%	1.6%
	Resource	20.2%	20.2%	79.8%	79.8%	0.0%	0.0%	79.8%	79.8%	0.0%	0.0%	100.0%	100.0%
	Total	0.1%	0.3%	0.6%	1.3%	0.0%	0.0%	0.6%	1.3%	0.0%	0.0%	0.7%	1.6%
Pink Salmon	Gear Type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	100.0%	100.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Sockeye Salmon	Gear Type	79.5%	62.3%	95.1%	94.1%	15.6%	15.6%	92.1%	91.1%	74.8%	73.1%	91.6%	90.4%
	Resource	0.6%	0.6%	96.8%	96.8%	0.6%	0.6%	97.4%	97.4%	2.0%	2.0%	100.0%	100.0%
	Total	0.5%	0.5%	88.6%	87.5%	0.6%	0.6%	89.2%	88.1%	1.8%	1.8%	91.6%	90.4%
Sockeye	Gear Type	0.0%	0.0%	2.2%	2.2%	84.0%	83.9%	5.3%	5.3%	8.5%	8.3%	5.4%	5.3%
	Resource	0.0%	0.0%	38.0%	38.0%	58.1%	58.1%	96.1%	96.1%	3.9%	3.9%	100.0%	100.0%
	Total	0.0%	0.0%	2.0%	2.0%	3.1%	3.1%	5.1%	5.1%	0.2%	0.2%	5.4%	5.3%
Unknown Salmon	Gear Type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%	1.3%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	100.0%	100.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Source ADF&G Division of Subsistence & UAF household survey, 2012.

In 2011, a majority of the salmon were harvested locally near the community of Kokhanok at resident fish camps. Set gillnets anchored off the beach are the dominant gear type in this fishery with nets located close together, as well as close to fish processing locations which consistent of smoke houses, a cutting table, and fish bins. The fish bins placed just offshore are usually made of wire mesh that allow cold lake water to wash the fish for 24 hours after the salmon are harvested; the moving water removes the slime and softens the meat. (Fall, et al. 2010). Figure 4-6 shows the areas where residents reported fishing for salmon.

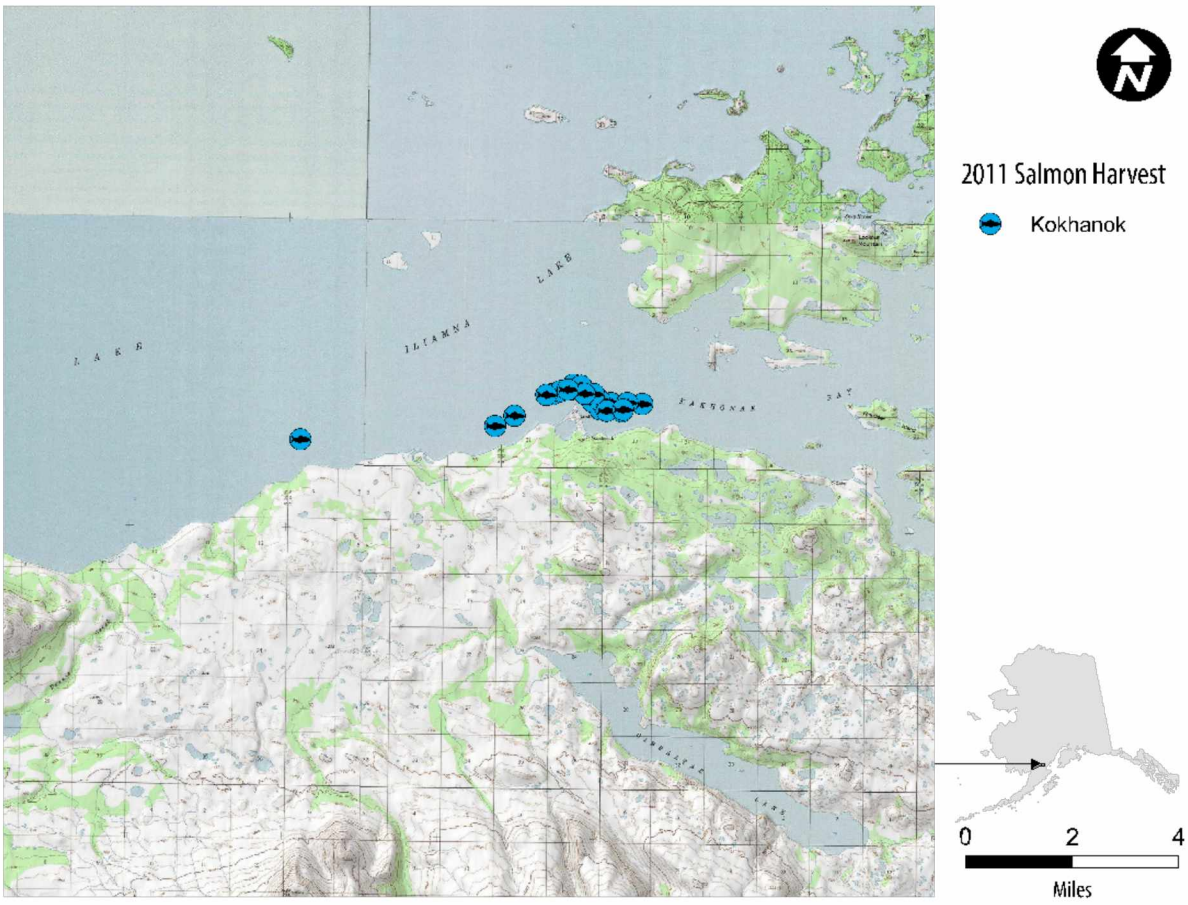

Figure 4-6. Salmon harvest locations, Kokhanok, 2011

Map by Davin Holen

TYONEK

In 2011, Tyonek Bay residents harvested 2,881 salmon, for a total of 21,488 pounds. The per capita harvest was 141 lb, and the mean household harvest was 341 lb (Table 4-6). In Tyonek, the subsistence harvest is predominantly composed of Chinook salmon; however, low returns of Chinook salmon in recent years have meant a greater reliance on coho and sockeye salmon (Fall, et al. 2014; Holen and Fall

2011; Oslund and Ivey 2013). Of the total salmon harvest, 53% was Chinook salmon, followed by coho salmon (25%), sockeye salmon (14%), pink salmon (2%), spawning sockeye salmon (2%), and chum salmon (1%; Figure 4-7). In terms of pounds harvested, 92% of the harvest was by subsistence gear, a set gill net anchored off the beach as allowed in the Tyonek Subdistrict Subsistence fishery (Table 4-7). Residents harvest salmon in the commercial fishery along the same stretch of beach as the subsistence fishery and 7% of the salmon residents brought into their households was salmon obtained from their participation in the commercial fishery, while another 2% was harvested using rod and reel (Table 4-7).

Table 4-6. Estimated harvests and uses of salmon, Tyonek, Alaska, 2011

	Percentage of households					Harvest weight (lb)			Harvest amount			95%
	Use	Attempt	Harvest	Receive	Give		Mean				Mean	confidence
Resource	%	%	%	%	%	Total	househol	Per capita	Total	Unit	household	limit (±)
Salmon	89.5	81.6	81.6	57.9	55.3	21,487.9	341.1	140.9	2,881.4	Ind.	45.7	10.7
Chum Salmon	7.9	7.9	7.9	7.9	5.3	275.4	4.4	1.8	51.4	Ind.	0.8	42.2
Coho Salmon	60.5	60.5	55.3	34.2	28.9	5,309.9	84.3	34.8	1,076.0	Ind.	17.1	34.8
Chinook Salmon	89.5	81.6	81.6	47.4	44.7	11,478.7	182.2	75.3	770.9	Ind.	12.2	35.1
Pink Salmon	7.9	7.9	7.9	2.6	2.6	454.2	7.2	3.0	157.5	Ind.	2.5	57.5
Sockeye Salmon	42.1	42.1	39.5	21.1	26.3	2,943.2	46.7	19.3	649.9	Ind.	10.3	11.4
Spawnouts	5.3	5.3	5.3	5.3	5.3	420.5	6.7	2.8	92.8	Ind.	1.5	27.0
Spawning Sockeye	5.3	5.3	5.3	5.3	5.3	420.5	6.7	2.8	92.8	Ind.	1.5	27.0
Unknown Salmon	5.3	2.6	2.6	2.6	0.0	606.0	9.6	4.0	82.9	Ind.	1.3	58.2

Source: ADF&G and UAF household surveys, 2012.

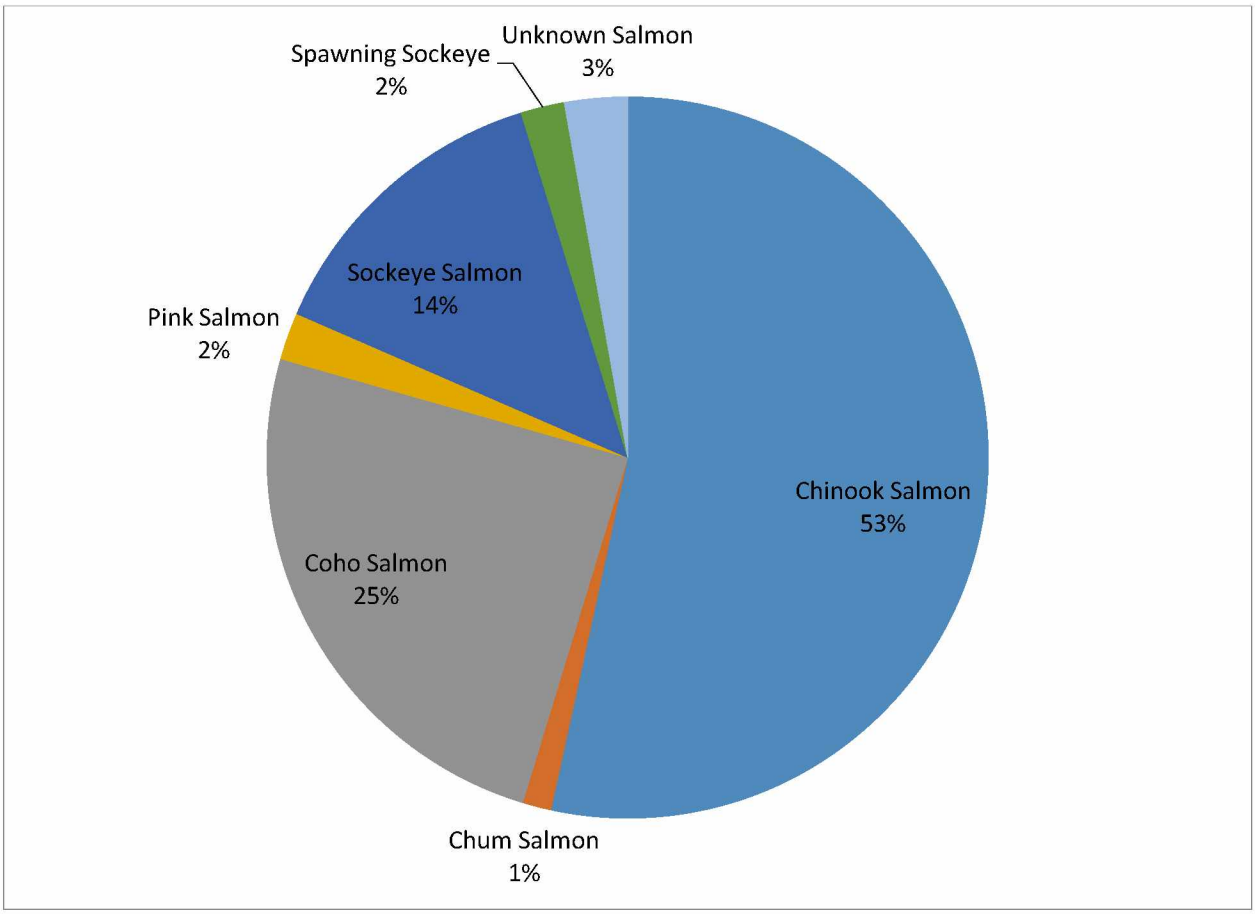

Figure 4-7. Percentage of salmon harvested by weight, Tyonek, 2011

Table 4-7. Estimated percentages of salmon harvested by gear type, resource, and total nonsalmon fish harvest, Tyonek, Alaska, 2011

				Subsistence methods									
		Removed from commercial catch		Setnet		Seine		Subsistence gear, any method		Rod and reel		Any method	
Resource	Percentage base	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.	No.	Lbs.
Salmon	Gear Type	100.0%	100.0%	100.0%	100.0%	0.0%	0.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	Resource	8.6%	7.0%	89.2%	91.5%	0.0%	0.0%	89.2%	91.5%	2.1%	1.5%	100.0%	100.0%
	Total	8.6%	7.0%	89.2%	91.5%	0.0%	0.0%	89.2%	91.5%	2.1%	1.5%	100.0%	100.0%
Chum Salmon	Gear Type	0.0%	0.0%	2.0%	1.4%	0.0%	0.0%	2.0%	1.4%	0.0%	0.0%	1.8%	1.3%
	Resource	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	100.0%	100.0%
	Total	0.0%	0.0%	1.8%	1.3%	0.0%	0.0%	1.8%	1.3%	0.0%	0.0%	1.8%	1.3%
Coho Salmon	Gear Type	43.3%	35.5%	36.0%	23.3%	0.0%	0.0%	36.0%	23.3%	67.6%	62.2%	37.3%	24.7%
	Resource	10.0%	10.0%	86.1%	86.1%	0.0%	0.0%	86.1%	86.1%	3.9%	3.9%	100.0%	100.0%
	Total	3.7%	2.5%	32.2%	21.3%	0.0%	0.0%	32.2%	21.3%	1.4%	1.0%	37.3%	24.7%
Chinook Salmon	Gear Type	13.3%	32.9%	28.6%	55.6%	0.0%	0.0%	28.6%	55.6%	5.4%	15.0%	26.8%	53.4%
	Resource	4.3%	4.3%	95.3%	95.3%	0.0%	0.0%	95.3%	95.3%	0.4%	0.4%	100.0%	100.0%
	Total	1.2%	2.3%	25.5%	50.9%	0.0%	0.0%	25.5%	50.9%	0.1%	0.2%	26.8%	53.4%
Pink Salmon	Gear Type	3.3%	1.6%	5.8%	2.2%	0.0%	0.0%	5.8%	2.2%	0.0%	0.0%	5.5%	2.1%
	Resource	5.3%	5.3%	94.7%	94.7%	0.0%	0.0%	94.7%	94.7%	0.0%	0.0%	100.0%	100.0%
	Total	0.3%	0.1%	5.2%	2.0%	0.0%	0.0%	5.2%	2.0%	0.0%	0.0%	5.5%	2.1%
Sockeye Salmon	Gear Type	6.7%	5.0%	24.0%	14.2%	0.0%	0.0%	24.0%	14.2%	27.0%	22.8%	22.6%	13.7%
	Resource	2.6%	2.6%	94.9%	94.9%	0.0%	0.0%	94.9%	94.9%	2.6%	2.6%	100.0%	100.0%
	Total	0.6%	0.3%	21.4%	13.0%	0.0%	0.0%	21.4%	13.0%	0.6%	0.3%	22.6%	13.7%
Spawning Sockeye	Gear Type	33.3%	25.0%	0.4%	0.2%	0.0%	0.0%	0.4%	0.2%	0.0%	0.0%	3.2%	2.0%
	Resource	89.3%	89.3%	10.7%	10.7%	0.0%	0.0%	10.7%	10.7%	0.0%	0.0%	100.0%	100.0%
	Total	2.9%	1.7%	0.3%	0.2%	0.0%	0.0%	0.3%	0.2%	0.0%	0.0%	3.2%	2.0%
Unknown Salmon	Gear Type	0.0%	0.0%	3.2%	3.1%	0.0%	0.0%	3.2%	3.1%	0.0%	0.0%	2.9%	2.8%
	Resource	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	100.0%	100.0%
	Total	0.0%	0.0%	2.9%	2.8%	0.0%	0.0%	2.9%	2.8%	0.0%	0.0%	2.9%	2.8%

Source: ADF&G Division of Subsistence & UAF household survey, 2012.

As noted above, Chinook salmon is the species of salmon targeted by Tyonek residents, and 90% of households reported using Chinook salmon during the study year, with 82% of households reporting attempting to harvest and harvesting Chinook salmon during the study year (Table 4-6). The total harvest of sockeye salmon was 771 salmon. A majority of the Chinook salmon harvested during the study year were harvested in the subsistence fishery (95%). Few Chinook are removed from commercial harvests as the commercial fishery has been closed in recent years during the early Chinook salmon run to allow for escapement of Chinook into Upper Cook Inlet drainages. The commercial fishery targets sockeye and coho salmon. However, a few Chinook salmon were harvested and retained during the latter part of the Chinook run after the commercial fishery opened and 4% of the overall harvest of Chinook salmon for home use was obtained from the commercial fishery (Table 4-7). Rod and reel accounted for less than 1% of the overall Chinook salmon harvest, as the sport rod and reel harvest for

Chinook salmon has been closed as well in recent years. Chinook salmon was the most shared species of salmon with 45% of households giving away Chinook salmon and 47% receiving Chinook salmon (Table 4-6).

The second most harvested species of salmon for subsistence in 2001 was coho salmon. An estimated 61% of households reported using and attempting to harvest coho salmon while an estimated 55% of households harvested coho salmon (Table 4-6). The total harvest of coho salmon was 1,076 salmon. The majority (86%) of coho salmon were harvested in the subsistence fishery and of the remaining harvest, 10% were harvested in the commercial fishery and retained for home use, while 4% were harvested using rod and reel (Table 4-7). Sharing of coho salmon was also high with an estimated 29% of households giving away coho salmon and 34% receiving coho salmon (Table 4-6).

Sockeye salmon are also important. The run arrives shortly after the Chinook harvest and if residents did not meet their harvesting goals during the Chinook salmon run they will continue to fish and harvest sockeye salmon. Sockeye salmon arrive in June, followed by coho salmon, which arrive in July and continue through August. In 2011 an estimated 42% of households used and attempted to harvest sockeye salmon, while 40% harvested the resource (Table 4-6). An estimated 650 sockeye salmon were harvested. Almost all sockeye salmon (95%) were harvested in the subsistence fishery. An estimated 3% were harvested in the sport rod and reel fishery and while an additional 3% were removed from harvests in the commercial fishery (Table 4-7).

Additional salmon harvested included pink and chum salmon. These are often incidentally harvested in the subsistence fishery and retained for home use (Table 4-7). In 2011 an estimated 160 pink salmon and 51 chum salmon were harvested (Table 4-6). These are not widely used nor shared (Table 4-6).

In Tyonek in 2011 the salmon harvest was caught locally within the boundaries of the Tyonek Subdistrict Subsistence fishery (Figure 4-8). As shown on the map, the fishery begins just south of the Chuitna River and stretches south along the beach to Granite Point. Nets are spaced out along the beach at no closer than 300 feet apart. The nets are fished during the high tide when the salmon run along the shore towards the Chuitna River and further north into other rivers such as the Theodore and Lewis Rivers as well as into the Susitna River drainage.

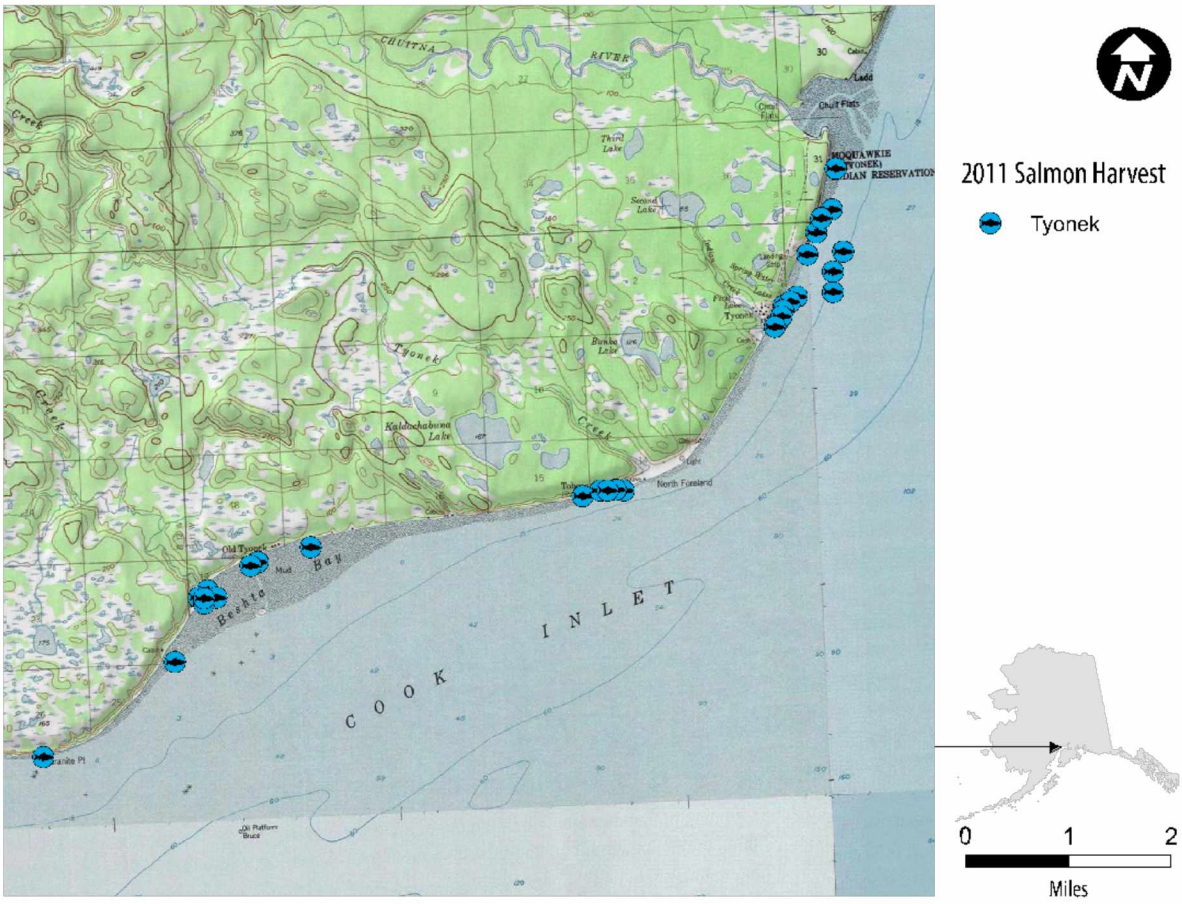

Figure 4-8. Salmon harvest locations, Tyonek, 2011

Map by Davin Holen

Uniqueness of the Three Fisheries

Having spent several years working in each of the three study communities, and observing the salmon fisheries, I chose these three communities as each fishery is unique but still an important component of the annual cycle of wild resource harvest. Below is a discussion of the similarities, differences, and respondent evaluations of importance of the fisheries to each community. These fisheries are representative of other fisheries in Alaska. However, in order to determine just how representative they are, following this discussion are findings from other surveys conducted in coastal communities in Alaska.

Chenega Bay is a marine fishery where most of the harvest is either by drift gillnet or rod and reel. Residents share the harvest widely with 75% receiving salmon and 69% giving away salmon; however, participation in fishing is low with only 36% of residents participating in the salmon fishery, although 81% of households had a household member who harvested salmon (Tables 4-1 and 4-2). This means that fewer household members were participating in harvesting activities, which were then widely shared between households. Previous studies have shown that in most rural communities in Alaska, a relatively small portion of households produce most of the community's fish and wildlife harvests, which are then distributed to other households (Wolfe, et al. 2010; Wolfe and Walker 1987). Analysis in the 1980s showed that in most rural communities 30% of households produce 70% of the wild resource harvest in a rural community (Wolfe and Walker 1987). When this analysis was run again more recently using a sample size of 3,265 households in 66 rural Alaska communities, the study found that about 33% of the households accounted for 76% of subsistence harvests (Wolfe, et al. 2010). This method of analysis was used to assess the findings from the three study communities.

During the study year of 2011 in Chenega Bay, 25% of households harvested 67% of the salmon in the community (Figure 4-9). Using subsistence salmon harvest permit data for Chenega Bay, in 2012 eight households harvested 1,690 salmon in the subsistence fishery, for an average of 211 salmon per household (Fall, et al. 2014:223). Due to the need to harvest using drift gillnets in the marine fishery, this activity is more specialized and requires access to a net and a boat. Households harvest larger numbers of salmon and then distribute them to other households.

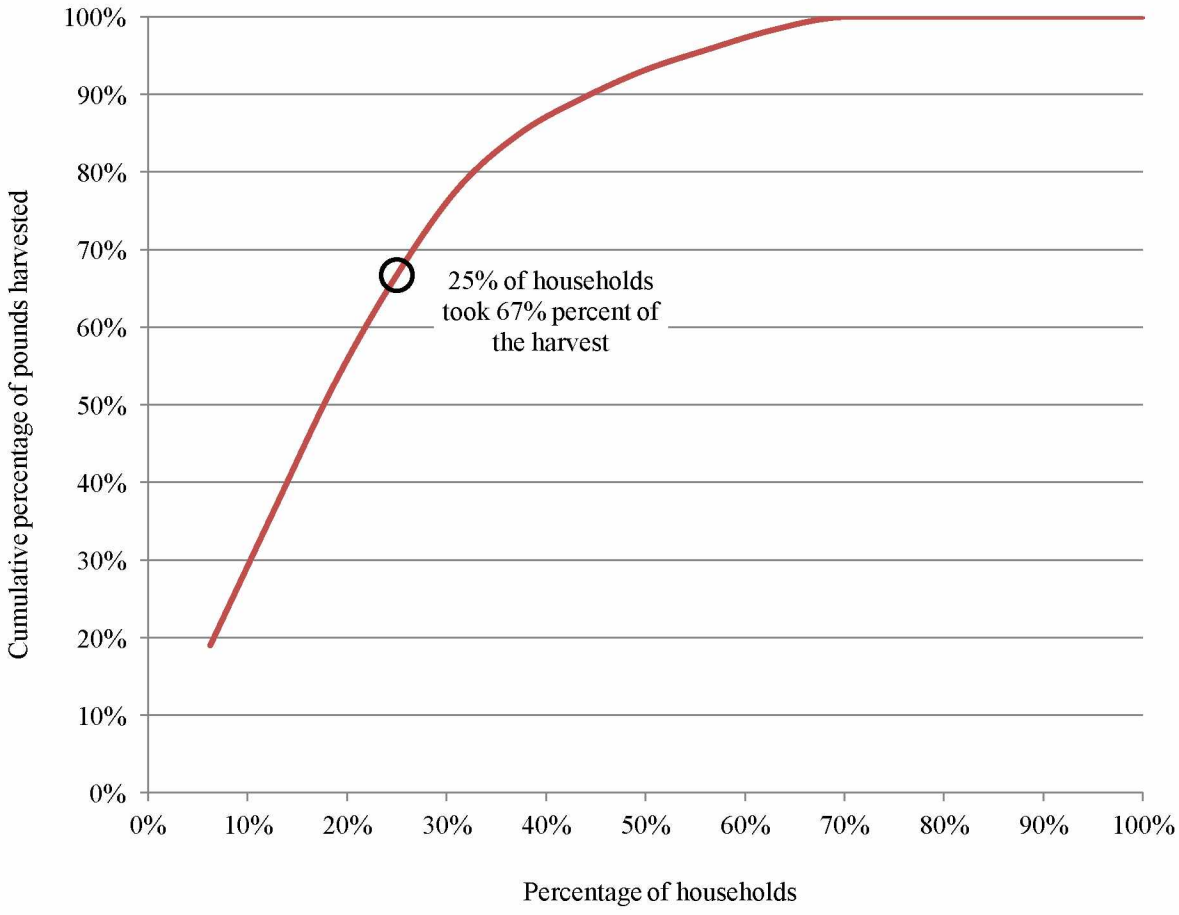

Figure 4-9. Specialization of harvesting, Chenega Bay, 2011

Kokhanok and Tyonek had higher percentages of individual participation in the salmon fishery with 64% and 67% of residents participating respectively. Both are beach access fisheries and most families either have, or have access to a set gillnet (Table 4-1). In both communities, families often work together with other extended family members sharing equipment. Both communities also had a high number of households harvesting salmon, 81% in Kokhanok and 82% in Tyonek (Table 4-4 and 4-6). Sharing was highest in Kokhanok with 77% of households giving salmon and 74% receiving salmon, whereas in Tyonek an estimated 55% gave salmon and 58% received salmon.

Figure 4-10 shows that in Kokhanok during 2011, 26% of households harvested 69% of the salmon, although there is easier access to the fishery and higher individual participation. However, there are a few high harvesting households that will invest significant time, energy, and resources in harvesting large numbers of salmon that are then distributed to other households, or that are processed and sent to relatives outside the community. In the subsistence fishery Kokhanok has a high harvest per permit issued. Using subsistence salmon harvest permit data in 2012 there were 27 subsistence salmon permits issued in Kokhanok with an estimated harvest of 16,755 salmon, or 620 salmon per permit (Fall, et al. 2014:111). Residents in Kokhanok and other surrounding communities note that even for households that eat a significant amount of salmon and send it to relatives outside the community the harvesting goal is usually around 300 salmon. This means that in Kokhanok some households were harvesting almost twice this amount, which was then shared with other households.

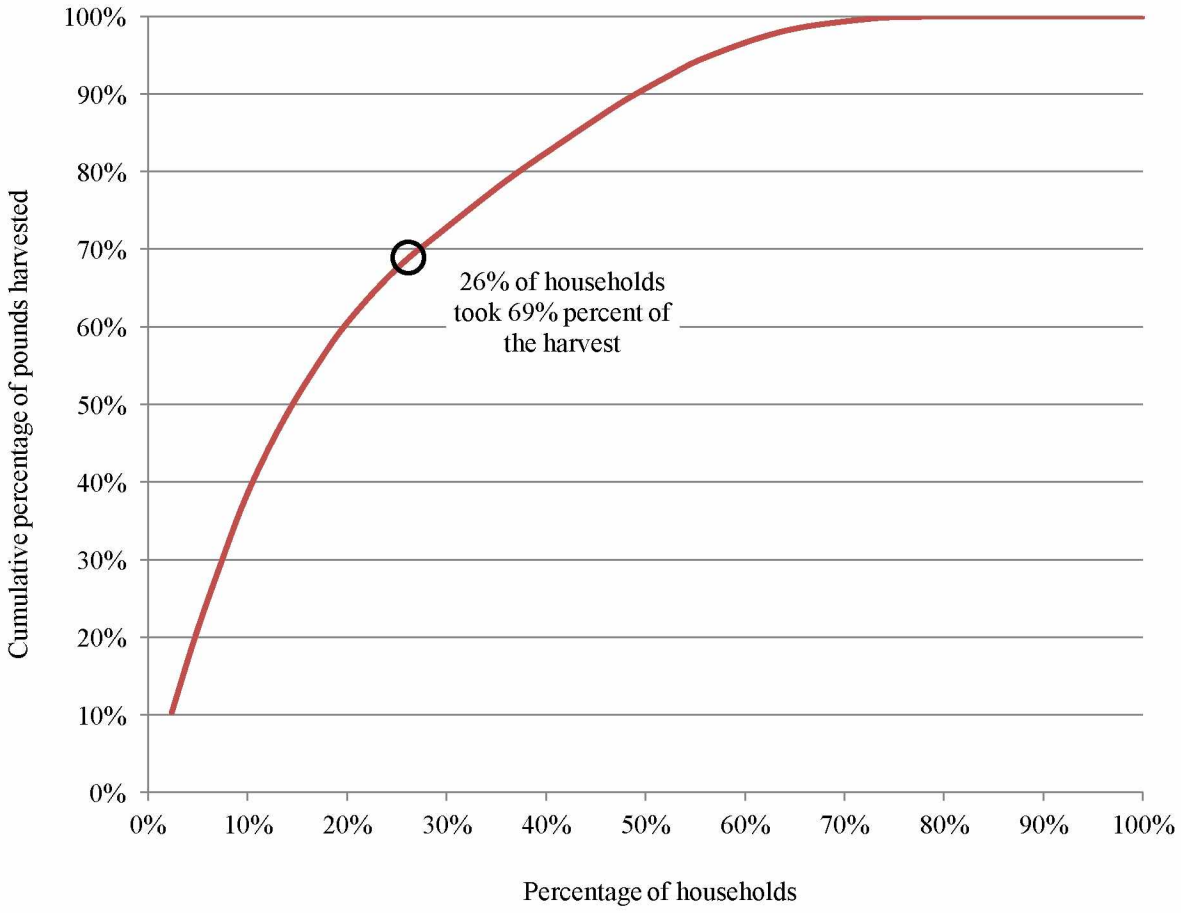

Figure 4-10. Specialization of harvesting, Kokhanok, 2011

This can be compared to Tyonek with 63 subsistence salmon permits in 2012 with a total harvest of 942 salmon, or 15 salmon per permit (Fall, et al. 2014:179). Nevertheless, there are some high harvesting households in Tyonek with 18% of households harvesting 69% of the salmon in 2011 (Figure 4-11). From analyzing permit returns in the community overall there are a select number of households who invest significant time and energy in the fishery; they will fish most fishery openings harvesting more salmon per permit, whereas, there are many households that fish only a few openings each season due to work and other conflicts as noted below.

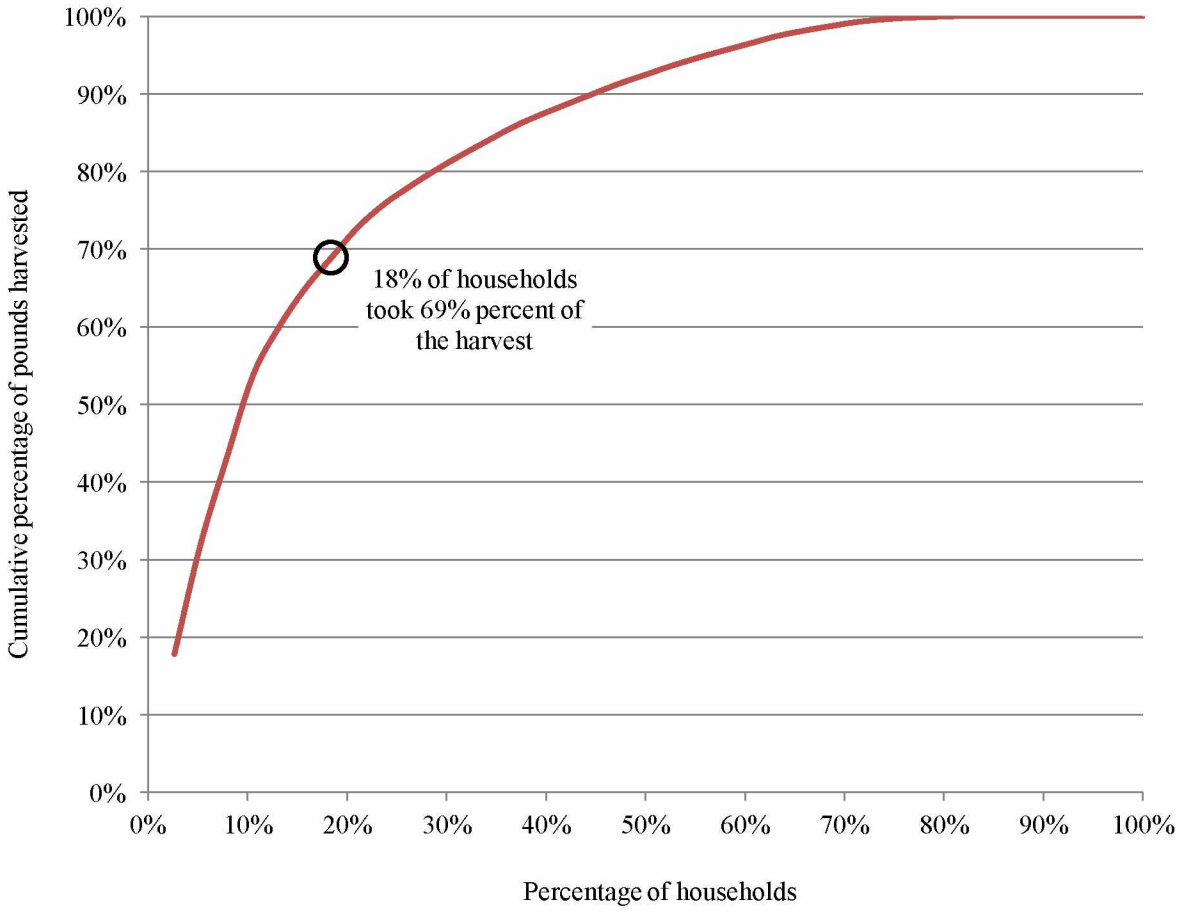

Figure 4-11. Specialization of harvesting, Tyonek, 2011

During the survey, residents were asked if their harvest and use of salmon was the same, less, or more than in recent years, which is about the past 5 years. In 2011, 16 households were surveyed in Chenega Bay, 43 in Kokhanok, and 38 in Tyonek (Table 1-1). In Tyonek, a majority of respondents reported that they were harvesting less than in recent years, Kokhanok respondents said it was about the same, and in Chenega Bay there were an even amount of responses that residents were harvesting either less or the same (Figure 4-12). Overall responses were mixed as to the reasons why residents did not get enough salmon in 2011. Responses are not expanded and only those that responded that they used less salmon

in 2011 are shown in Table 4-8. For Chenega Bay there were 10 responses of less use out of 16 surveyed households, 31 in Kokhanok out of 43 households, and 19 in Tyonek out of 38 households. Figure 4-12 shows that in Tyonek the main reason was less availability of the resource. As discussed above, Chinook salmon abundance has been lower in recent years in Upper Cook Inlet. A similar response is that residents were unsuccessful in harvest, which means an absence of Chinook salmon during harvesting activities. Some residents reported social and personal reasons such as not attempting to harvest, work interference with fishing activities, equipment unavailability, lower effort into fishing, or they did not need the resource (Figure 4-13).

For households reporting greater use of salmon, there was 1 response in Chenega Bay out of 16 surveyed households, 7 in Kokhanok out of 43 households, and 4 in Tyonek out of 38 households (Table 4-9). Responses mainly had to do with social issues such as receiving more in Tyonek, to needing more in Chenega Bay and Kokhanok, to increased effort in Kokhanok and Tyonek (Figure 4-14). In Kokhanok, respondents noted that they got more help fishing and therefore more fish.

Table 4-8. Summary of households responding to less use than recent years, by community, 2011

	Community					
	Chenga Bay		Kokhanok		Tyonek	
	No.	%	No.	%	No.	%
Total households Surveyed	16	100.0	43	100.0	38	100.0
Households responding	15	93.8	41	95.3	35	92.1
Households reporting less use	10	66.7	31	75.6	19	54.3
Households providing reasons	6	60.0	11	35.5	19	100.0

Source: ADF&G Division of Subsistence & UAF household surveys, 2011.

Table 4-9. Summary of households responding to more use than recent years, by community, 2011

	Community					
	Chenega Bay		Kokhanok		Tyonek	
	No.	%	No.	%	No.	%
Total households Surveyed	16	100.0	43	100.0	38	100.0
Households responding	15	93.8	41	95.3	35	92.1
Households reporting more use	1	6.7	7	17.1	4	11.4
Households providing reasons	1	100.0	6	85.7	4	100.0

Source: ADF&G Division of Subsistence & UAF household surveys, 2011.

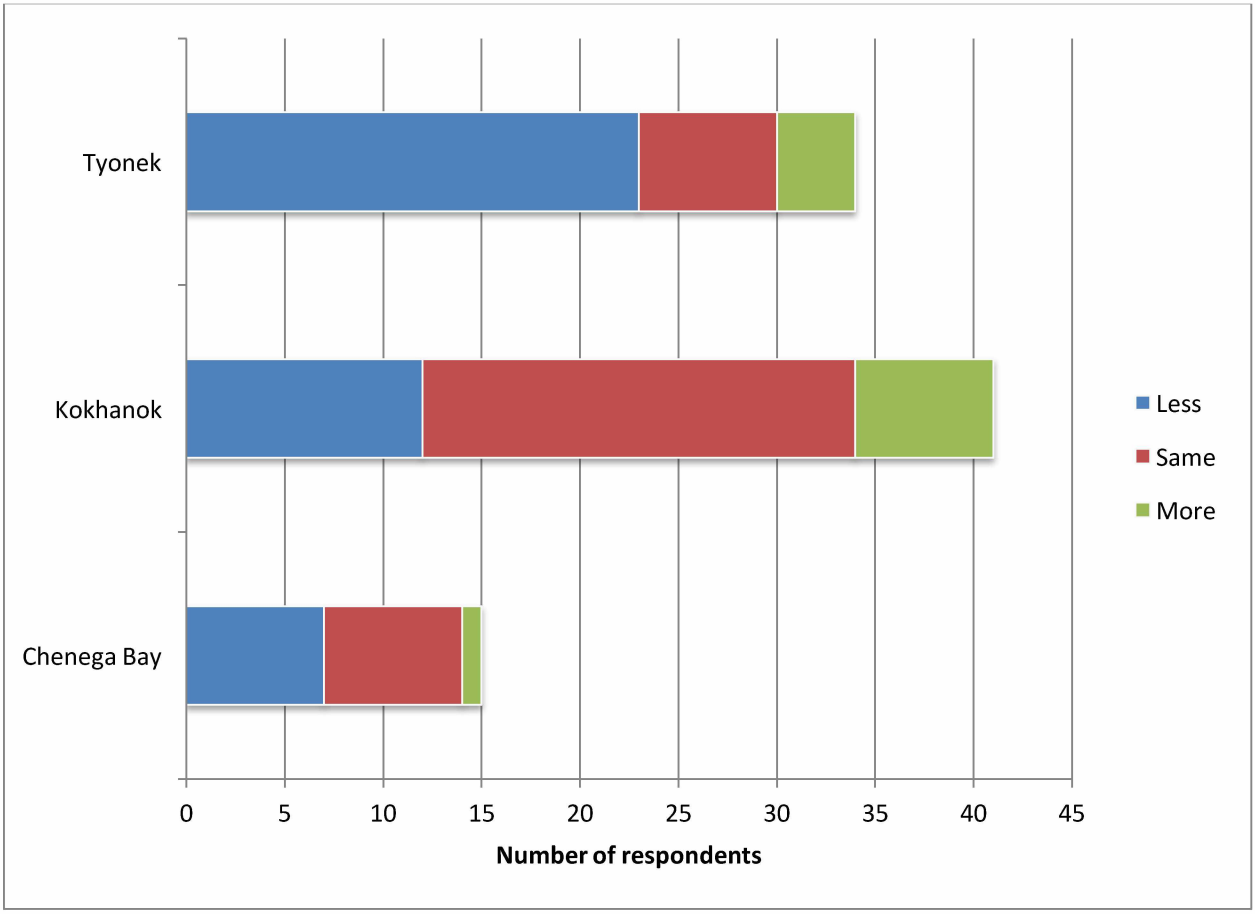

Figure 4-12. Respondents use of salmon in 2011 compared to recent years, study communities

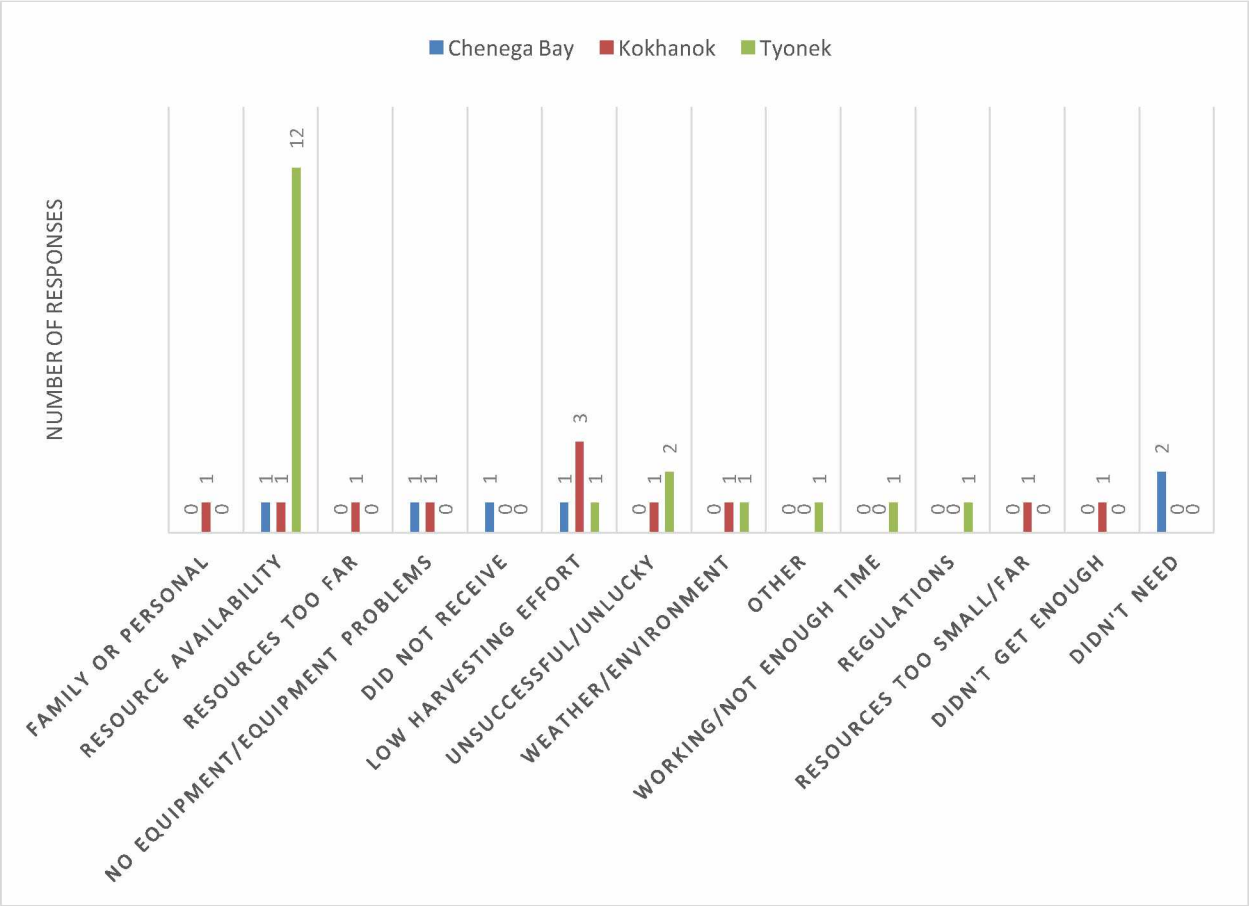

Figure 4-13. Reasons respondents gave for less use of salmon than in recent years, study communities

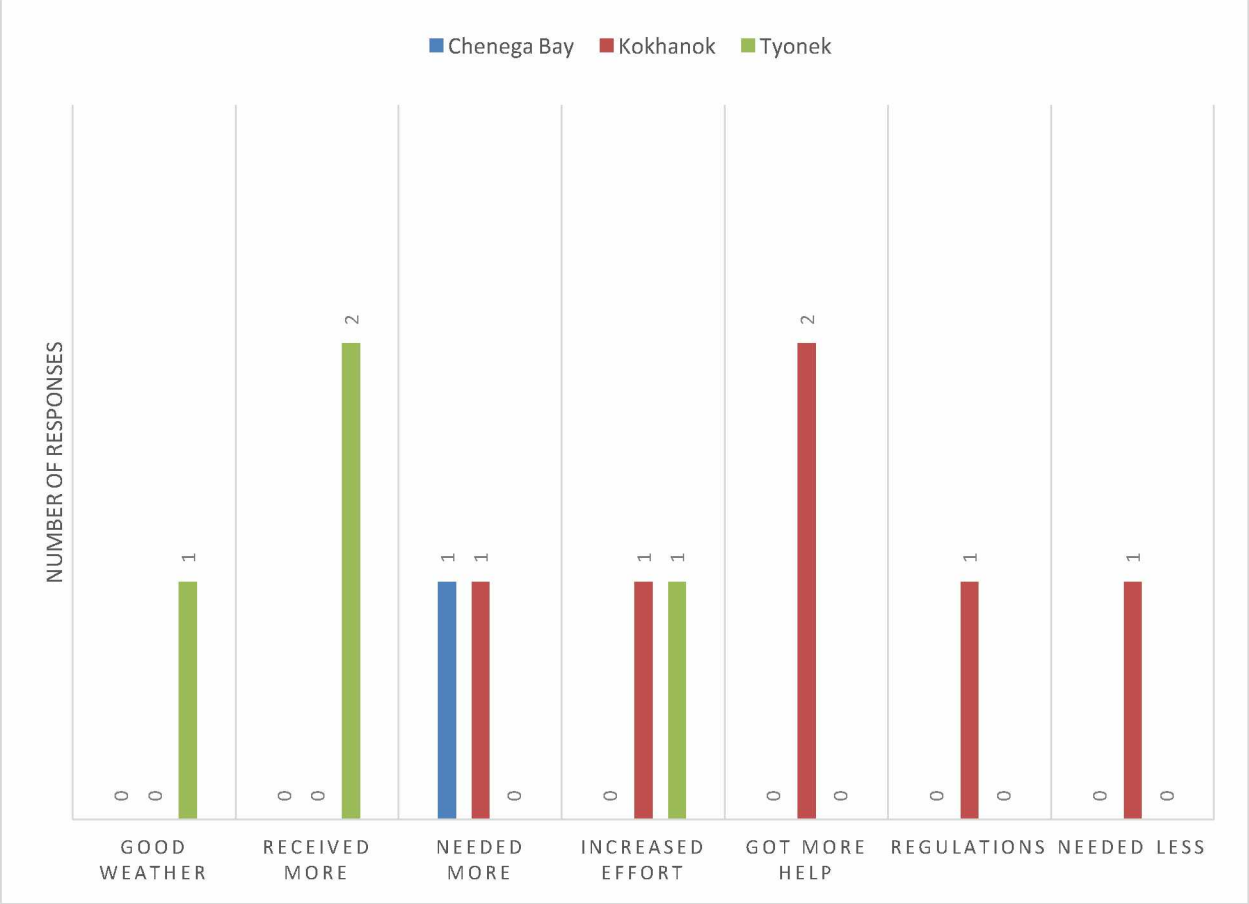

Figure 4-14. Reasons respondents gave for more use of salmon than in recent years, study communities

Comparative Communities

The goal of this project is to provide comparisons between three communities that represent three different areas of Alaska with different levels of harvest and harvesting strategies. To evaluate whether a generalization regarding the subsistence economy of a community and the level of food security that economy provides to a coastal community could be used as a proxy for other nearby similar coastal communities, additional findings are included below. These include comparison from other regions of

Alaska such as the Alaska Peninsula, Kodiak, and Southeast Alaska where recent data are available. These comparative communities include the Chignik area on the south side of the Alaska Peninsula, 3 communities on Kodiak Island, and 5 communities in Southeast Alaska (Figure 1-1). This section will cover subsistence, while other data will be included in the next two chapters to discuss the commercial fishing economy and socio-cultural aspects of each community and region. These surveys were opportunistic based on project funding and the data provided such as harvest and use was a core component of each survey while the specialized evaluation questions were added to benefit this project. Each project was unique in terms of goals and objectives so survey questions were not always consistent. The evaluation questions asked in the three core study communities were the first attempt to ask questions on survey forms by ADF&G of this nature. In subsequent surveys in Chignik, Kodiak, and Southeast Alaska, improvements to the set of questions were made including additional questions; therefore, the sections that follow include some tables and figures not included for the three core case study communities. Also, as the goal here is to provide some summary comparisons to other fishery dependent communities, this section will not go into as much detail as the previous section for the three study communities and some tables and figures have been combined or the data has been summarized.

CHIGNIK

Salmon are important for both commercial fishing and subsistence on the Alaska Peninsula. Communities on the south side of the Alaska Peninsula are close geographically; nevertheless, each has unique fisheries as will be explored below. Located on the south side of the Alaska Peninsula in the Gulf of Alaska within the Lake and Peninsula Borough are the communities of Chignik Bay (pop. 96), Chignik Lake (pop. 70), Chignik Lagoon (pop. 72), and Perryville (pop. 101) (ADLWD 2015) (Figure 1-1).

Harvesting of salmon can vary significantly even between neighboring communities; Chignik area communities display differences in overall harvest and use of salmon (Table 4-10) (CSIS 2015). Harvest surveys were conducted in the four communities by ADF&G in 2012 for the 2011 study year (Hutchinson-Scarbrough, et al. 2016). The mean household harvest of salmon varied between 77 salmon in Chignik Lagoon to 148 salmon in Perryville, with a per capita harvest difference between 158 lb per person in Chignik Lagoon to 230 lb per person in Perryville. However, in terms of harvest and use, over 90% of households in all four communities reported using salmon, and anywhere from 61% in Chignik Bay to 82% in Chignik Lake reported harvesting salmon in 2011. In all four communities, sockeye salmon represented a majority of the harvest in terms of number of fish harvested; 74% overall was sockeye, coho salmon 8%, spawning pink, sockeye, and coho combined 6%, pink salmon 6%, Chinook salmon 3%, and chum salmon 3% (Figure 4-15). Therefore, in all four neighboring communities although there are some differences in overall per capita harvest, the patterns of harvest are similar based on local species abundance. There are also similarities in household participation and harvest levels, although the there are differences in the number of salmon harvested. This demonstrates that there is a commonality in the importance of household participation and harvest of salmon by residents of all four Chignik area communities.

Table 4-10. Estimated harvests and uses of salmon in Chignik Bay, Chignik Lagoon, Chignik Lake, and Perryvile, 2011

	Percentage of households					Harvest weight (lb)			Harvest amount			95%
	Use	Attempt	Harvest	Receive	Give		Mean	Per			Mean	confidence
Chignik Bay	%	%	%	%	%	Total	household	capita	Total	Unit	household	limit (±)
Salmon	**91**	**65**	**61**	**48**	**52**	**16,249.2**	**625.0**	**211.4**			**116.1**	**22.7**
Chum salmon	13	13	13	0	4	202.1	7.8	2.6	39.6	Ind.	1.5	44.7
Coho salmon	43	22	22	30	17	445.7	17.1	5.8	88.2	Ind.	3.4	33.5
Chinook salmon	43	26	26	22	26	1,093.9	42.1	14.2	126.6	Ind.	4.9	41.3
Pink salmon	17	13	13	4	4	118.3	4.5	1.5	50.9	Ind.	2.0	40.4
Sockeye salmon	87	61	57	39	43	13,640.1	524.6	177.4	2,572.9	Ind.	99.0	21.7
Spawnouts	13	13	9	9	13	749.1	28.8	9.7	141.3	Ind.	5.4	57.5
Spawning pink	4	4	0	4	4	0.0	0.0	0.0	0.0	Ind.	0.0	0.0
Spawning sockeye	9	9	9	4	9	749.1	28.8	9.7	141.3	Ind.	5.4	57.5
Chignik Lagoon												
Salmon	**95**	**75**	**75**	**65**	**65**	**9,638.8**	**419.1**	**158.1**			**77.3**	**24.0**
Chum salmon	15	20	10	0	5	6.2	0.3	0.1	1.2	Ind.	0.1	71.7
Coho salmon	30	35	30	5	10	305.1	13.3	5.0	60.3	Ind.	2.6	32.8
Chinook salmon	65	55	50	25	15	1,500.3	65.2	24.6	173.7	Ind.	7.6	31.8
Pink salmon	35	30	20	15	20	272.7	11.9	4.5	117.3	Ind.	5.1	61.0
Sockeye salmon	95	75	70	55	65	7,280.1	316.5	119.4	1,373.2	Ind.	59.7	25.2
Spawnouts	5	5	5	0	5	274.4	11.9	4.5	51.8	Ind.	2.3	75.6
Spawning sockeye	5	5	5	0	5	274.4	11.9	4.5	51.8	Ind.	2.3	75.6
Chignik Lake												
Salmon	**100**	**86**	**82**	**86**	**86**	**17,858.6**	**661.4**	**194.0**			**124.7**	**21.6**
Chum salmon	14	14	14	0	9	31.3	1.2	0.3	6.1	Ind.	0.2	51.4
Coho salmon	32	32	32	5	18	583.2	21.6	6.3	115.4	Ind.	4.3	39.7
Chinook salmon	59	45	32	41	41	371.1	13.7	4.0	43.0	Ind.	1.6	39.8
Pink salmon	18	18	18	9	9	79.9	3.0	0.9	34.4	Ind.	1.3	47.0
Sockeye salmon	100	86	82	68	82	15,901.6	588.9	172.8	2,999.5	Ind.	111.1	23.2
Spawnouts	32	32	27	18	27	891.4	33.0	9.7	168.1	Ind.	6.2	45.8
Spawning sockeye	32	32	27	18	27	891.4	33.0	9.7	168.1	Ind.	6.2	45.8
Perryville												
Salmon	**96**	**75**	**68**	**75**	**61**	**23,238.2**	**707.9**	**230.5**			**148.3**	**20.9**
Chum salmon	32	36	21	21	14	1,395.5	42.5	13.8	273.2	Ind.	8.3	45.2
Coho salmon	71	57	43	54	43	3,905.7	119.0	38.7	772.6	Ind.	23.5	22.0
Chinook salmon	32	36	25	21	32	732.3	22.3	7.3	84.8	Ind.	2.6	36.8
Pink salmon	54	46	39	32	25	1,401.1	42.7	13.9	602.6	Ind.	18.4	25.5
Sockeye salmon	86	68	50	57	43	14,103.1	429.6	139.9	2,660.2	Ind.	81.0	25.7
Spawnouts	25	25	18	11	18	1,700.5	51.8	16.9	474.8	Ind.	14.5	41.5
Spawning coho	11	11	7	4	7	1,007.6	30.7	10.0	199.3	Ind.	6.1	54.4
Spawning pink	14	14	11	7	7	599.7	18.3	5.9	257.9	Ind.	7.9	48.8
Spawning sockeye	4	4	4	0	4	93.2	2.8	0.9	17.6	Ind.	0.5	77.2

Source ADF&G Division of Subsistence household surveys,

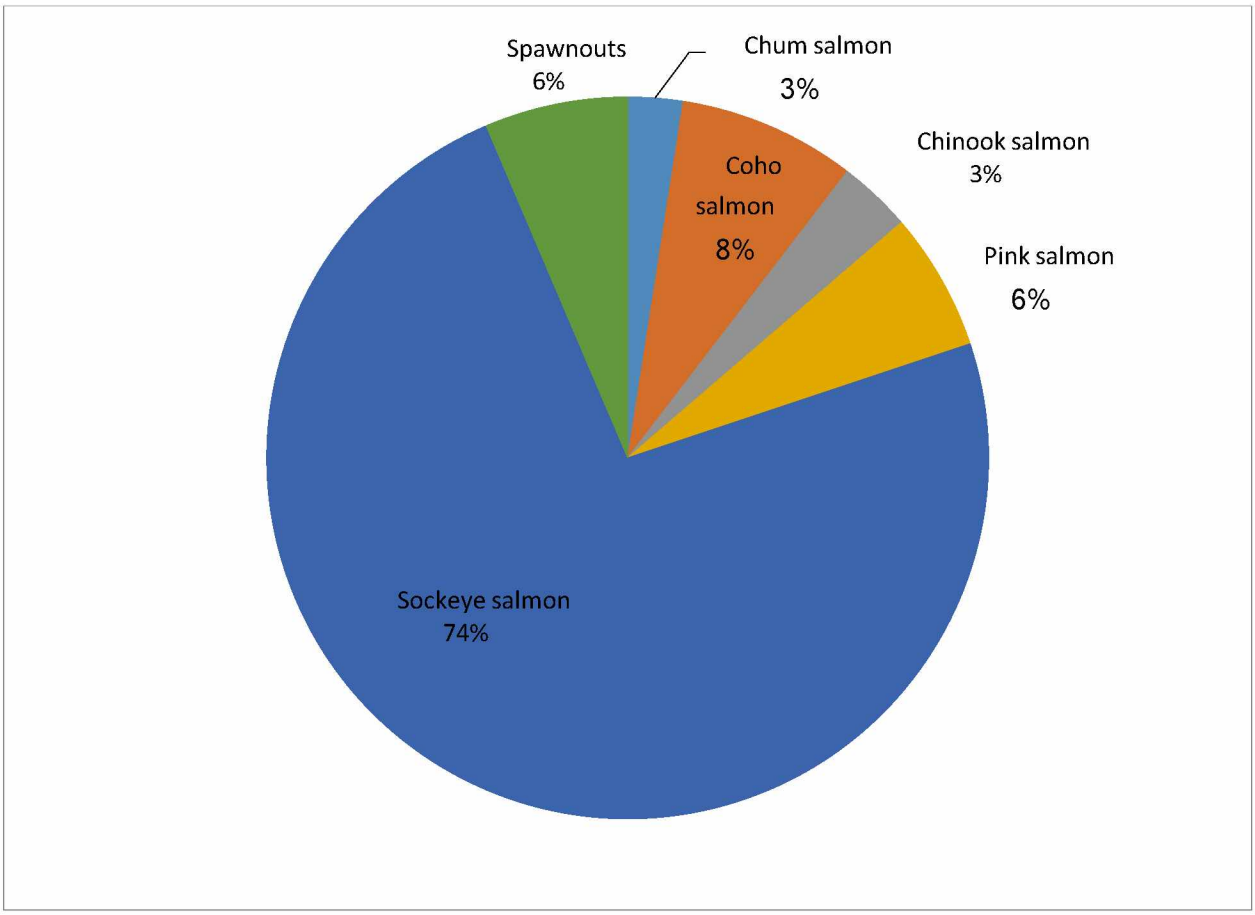

Figure 4-15. Percentage of salmon harvested by weight, Chignik area communities combined, 2011

Salmon are mainly harvested near the community by beach seine or by set gill net. For beach seine and set gill net a boat is necessary for deploying the gear. A question was added to this study to ascertain the estimated number of households who owned a boat during the study year. In the four study communities, a majority of households own a boat with 48% of households in Perryville owning a boat to 82% of households in Chignik Lake (Table 4-10). For the beach seine, which traps the fish, the seine is deployed on one end that is attached to the boat while several fishers on shore drag the other end down the beach. Eventually the boat circles into shore capturing the fish in the seine. For a set gill net

the net is anchored on one end to the beach and the other end deployed with a boat and anchored in the water. Seining is a quick efficient method of harvesting salmon; however, it requires a number of people to work together to ensure success (Holen 2009b). Set gill nets can be deployed and the salmon harvested by a single fishery.

About half of households in the four study communities owned a net during the study year. In Chignik Bay, 44% of households owned a net, whereas in Chignik Lake, household net ownership was 68% (Table 4-11). Although about half of households owned a net almost all households in the four study communities shared the net with other households. In Chignik Bay, Chignik Lagoon, and Perryville, nets were shared with an average of 2 other households and in Chignik Lake nets were shared with an average of 3 other households showing the importance of sharing gear. Although sharing of gear was not quantified in the three other communities, residents in Chenega Bay discussed the importance of sharing gear to ensure a successful harvest.

Table 4-11. Estimated number of households owning a boat, Chignik area communities, 2011

Community	Total households	Estimated number of households owning boats	
		Num.	%
Chignik Bay	26	16	60.9%
Chignik Lagoon	23	15	65.0%
Chignik Lake	27	22	82.4%
Perryville	34	16	48.3%

Source: ADF&G Division of Subsistence household surveys, 2012.

For the Chignik area communities, most respondents said that their harvest of salmon was less or the same in recent years. Like the three core case study communities, responses are not expanded; the number of households shown is the number surveyed. Figure 4-16 shows that responses were mixed with most households reporting that they used less salmon in recent years except for Chignik Bay where

more households reported using about the same amount of salmon. Responses to why residents harvested less were similar with most respondents saying there were fewer resources or personal reasons such as they didn't have equipment to harvest or they didn't try to harvest, they were working during the fishing season, with some noting that regulations prevented them from harvesting more salmon (Figure 4-17).

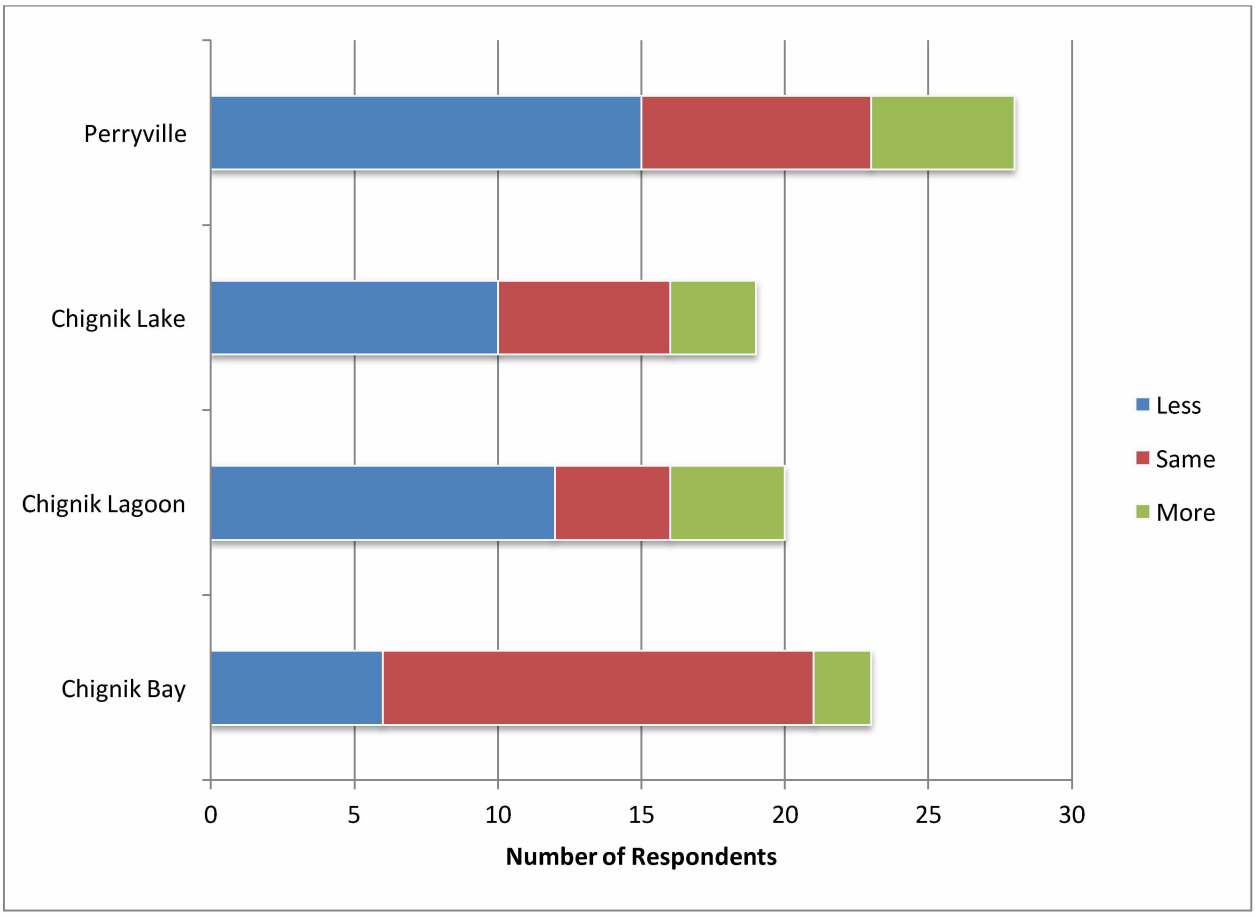

Figure 4-16. Respondents use of salmon in 2011 compared to recent years, Chignik area communities

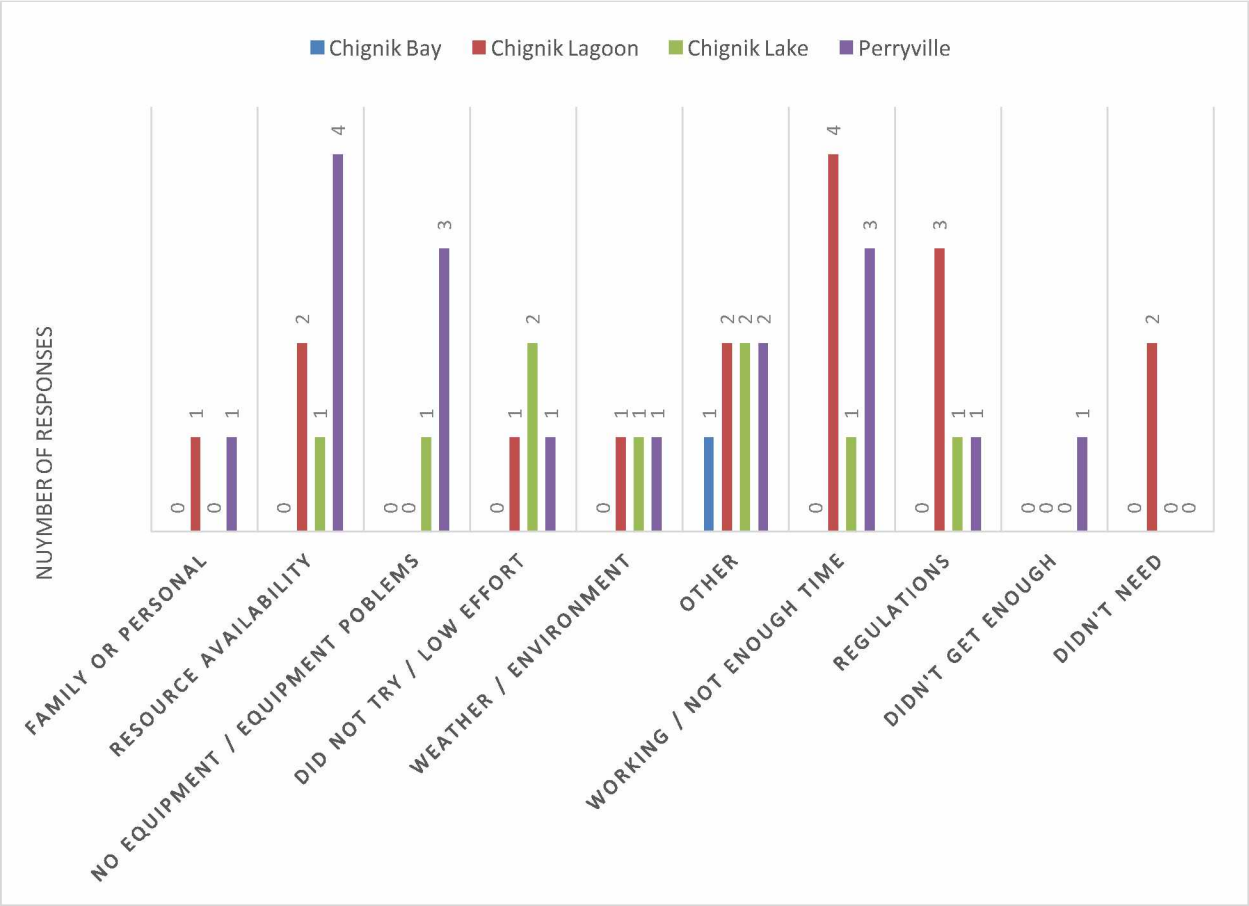

Figure 4-17. Reasons respondents gave for more use of salmon than in recent years, Chignik area communities

KODIAK

The marine waters surrounding Kodiak Island support abundant salmon. The river systems of Kodiak Island, especially the Karluk River near Larsen Bay, support some of the largest sockeye salmon runs in Alaska. For Kodiak residents, salmon are an important species for sport and subsistence activities, as well as for commercial fishing. Kodiak is ranked the third largest seafood port nationally based on ex-vessel value of product (Northern Economics 2009:19). The commercial fishery will be discussed in more detail in Chapter 6 Economy. In 2013, three communities were surveyed on Kodiak Island for a

project documenting the role of salmon in the social-ecological system of the Kodiak road system (Marchioni, et al. 2016). The goal was to compare the harvest, use, and participation in harvesting between a sample of salmon permit holders in Kodiak City (pop. 6,329), a sample of the rest of the community or what one would call the general population, and finally census samples in two smaller communities on the island to compare to Kodiak City. When designing the project area, fisheries managers recommended two communities on Kodiak Island off the road systems that have traditionally relied on the harvest of salmon to meet their subsistence harvesting goals. These are Larsen Bay (pop. 71), which also has a thriving sport fishing industry, and Old Harbor (pop. 213), which has a strong commercial fishing economy (ADLWD 2015) (Figure 1-1).

There is a significant difference between the two smaller, more isolated communities of Larsen Bay and Old Harbor and Kodiak City. There are also differences between the harvests of subsistence salmon permit holders in Kodiak City and the rest of the population. Harvest surveys were conducted in the three communities in 2013 for the 2012 study year with additional assessment questions asked to complement those of this study. Salmon harvests on Kodiak occur in the subsistence fishery and there are also high harvests in the sport rod and reel fishery (Fall, et al. 2006a). The mean household harvest of salmon varies greatly on Kodiak Island with an estimated annual harvest of 20 salmon in Kodiak City in the general population sample to 117 salmon in Larsen Bay (Table 4-12). The per capita harvest was 29 lb in Kodiak City and in the general population, 70 lb for the sample of subsistence permit holders in Kodiak City, to almost identical per capita harvests of 164 lb in Larsen Bay and 165 lb in Old Harbor. Although there were differences in harvest amounts, salmon are important for all four of the samples varying between 92% of households using salmon in the Kodiak City general population to all households in Larsen Bay and Old Harbor. Only 58% of households in Kodiak City among the general

population reported harvesting salmon but there was a high percentage reporting that they received salmon (61%) meaning that sharing of salmon is significant in the community. Subsistence salmon permit holders in Kodiak City harvested more salmon and did not receive as much (46%), although 55% of respondents reported giving salmon to other households. In the two smaller communities there was a higher percentage of harvesting salmon; 76% of households in Larsen Bay and 81% of households in Old Harbor. Both communities reported high percentages of sharing; 57% reporting giving salmon away in Larsen Bay and 77% in Old Harbor. In all four samples, sockeye salmon represented a majority of the harvest in terms of number of fish harvested: 53% overall was sockeye salmon, coho salmon was 29%, pink salmon 9%, Chinook salmon 6%, and chum salmon was 3% (Figure 4-18).

Table 4-12. Reported harvests and uses of salmon, Kodiak City, Larsen Bay, and Old Harbor, 2012

Kodiak City - Salmon Permit Holders	Percentage of households: Use %	Attempt %	Harvest %	Receive %	Give %	Harvest weight (lb): Total	Mean per household	Per capita	Harvest amount [a]: Total	Unit	Mean per household	95% confidence limit (±)
Salmon	**98.9**	**88.8**	**86.5**	**46.1**	**55.1**	**18,624.1**	**209.3**	**69.8**	**4,274.2**	**Ind.**	**48.0**	
Chum salmon	6.7	5.6	5.6	2.2	0.0	116.6	1.3	0.4	20.0	Ind.	0.2	
Coho salmon	68.5	65.2	59.6	15.7	24.7	4,614.2	51.8	17.3	883.9	Ind.	9.9	
Chinook salmon	56.2	53.9	36.0	25.8	11.2	1,247.0	14.0	4.7	235.0	Ind.	2.6	
Pink salmon	24.7	23.6	23.6	1.1	2.2	441.2	5.0	1.7	168.8	Ind.	1.9	
Sockeye salmon	92.1	77.5	75.3	31.5	48.3	12,205.0	137.1	45.7	2,966.4	Ind.	33.3	
Unknown salmon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	
Kodiak City - General Population Sample												
Salmon	**91.7**	**60.3**	**57.9**	**61.2**	**35.5**	**10,190.9**	**84.2**	**28.5**	**2,366.8**	**Ind.**	**19.6**	
Chum salmon	5.0	5.0	3.3	1.7	1.7	145.8	1.2	0.4	25.0	Ind.	0.2	
Coho salmon	62.8	43.0	37.2	29.8	14.0	2,865.8	23.7	8.0	549.0	Ind.	4.5	
Chinook salmon	39.7	26.4	19.8	24.0	9.1	853.8	7.1	2.4	160.9	Ind.	1.3	
Pink salmon	19.8	15.7	14.9	6.6	9.1	676.9	5.6	1.9	259.0	Ind.	2.1	
Sockeye salmon	78.5	44.6	39.7	49.6	25.6	5,648.7	46.7	15.8	1,372.9	Ind.	11.3	
Unknown salmon	0.8	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	
Larsen Bay												
Salmon	**100.0**	**81.0**	**76.2**	**57.1**	**57.1**	**12,620.8**	**485.4**	**164.4**	**3,053.1**	**Ind.**	**117.4**	**37.93**
Chum salmon	9.5	0.0	0.0	9.5	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.00
Coho salmon	57.1	42.9	38.1	28.6	19.0	1,156.9	44.5	15.1	221.6	Ind.	8.5	48.96
Chinook salmon	38.1	28.6	28.6	14.3	19.0	164.2	6.3	2.1	31.0	Ind.	1.2	39.90
Pink salmon	23.8	23.8	23.8	0.0	9.5	388.3	14.9	5.1	148.6	Ind.	5.7	37.58
Sockeye salmon	100.0	76.2	76.2	47.6	47.6	10,911.4	419.7	142.1	2,652.0	Ind.	102.0	41.77
Old Harbor												
Salmon	**100.0**	**81.3**	**81.3**	**77.1**	**62.5**	**33,212.8**	**425.8**	**164.8**	**7,841.5**	**Ind.**	**100.5**	**29.99**
Chum salmon	33.3	29.2	29.2	8.3	18.8	2,217.3	28.4	11.0	380.3	Ind.	4.9	45.03
Coho salmon	85.4	66.7	66.7	35.4	39.6	12,754.0	163.5	63.3	2,443.3	Ind.	31.3	30.27
Chinook salmon	45.8	31.3	31.3	22.9	16.7	2,086.7	26.8	10.4	393.3	Ind.	5.0	55.58
Pink salmon	68.8	56.3	56.3	18.8	33.3	5,002.7	64.1	24.8	1,914.3	Ind.	24.5	41.34
Sockeye salmon	79.2	50.0	50.0	52.1	39.6	11,152.1	143.0	55.3	2,710.5	Ind.	34.8	34.39

Source: ADF&G Division of Subsistence household surveys, 2013.

a. Summary rows that include incompatible units of measure have been left blank.

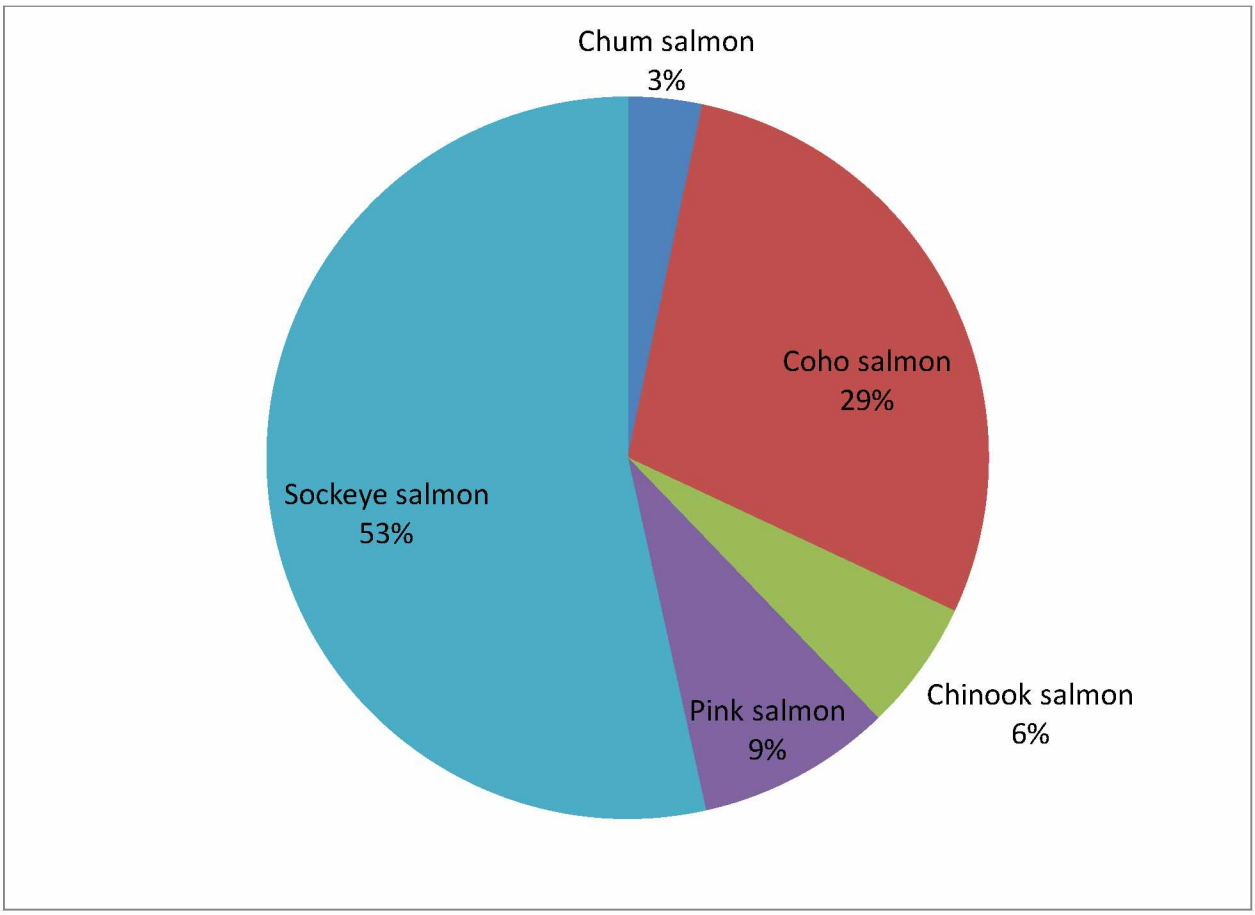

Figure 4-18. Percentage of salmon harvested by weight, Kodiak area communities combined, 2012

Respondents in this study were also asked various questions about the use of set nets for harvesting salmon. Table 4-13 shows that for subsistence salmon permit holders in Kodiak City and the communities of Larsen Bay and Old Harbor, there was a high percentage of households that used set nets for harvesting salmon. In Kodiak City over half (56%) of households who were subsistence salmon permit holders owned a net and the percentage was high among Larsen Bay (38%) and Old Harbor (40%). There were also residents of Kodiak City who were not on the subsistence salmon permit holder list who owned a net (19%). One of the issues this project dealt with was that the subsistence holder

permit list had not been updated in several years so it was expected that not all subsistence salmon fishers would be on the permit list and not everyone on the list would still be participating in the subsistence fishery (Marchioni, et al. 2016). One of the more interesting aspects was the amount of participation of households who fished with other households showing a cooperative fishing effort in the subsistence salmon fishery. In Kodiak City among permit holders this was highest with 87% reported fishing with another household, 76% for the general population, 63% in Old Harbor, and 37% in Larsen Bay.

Table 4-13. Comparison of reported household use of setnets, Kodiak City, Larsen Bay, Old Harbor, 2012

	Kodiak City Permit holders	Kodiak City General Population	Larsen Bay	Old Harbor
Households using setnets				
Number	46	17	11	27
Percentage	51.7%	14.0%	52.4%	56.3%
Mean years used	21.8	16.8	36	26.3
Median years used	20	14	40	25
Min years used	0	1	1	1
Max years used	64	75	74	70
Households fishing with others				
Number	40	13	4	17
Percentage [a]	87.0%	76.5%	36.4%	63.0%
Mean others fished with	2.6	1.6	1	2.6
Median others fished with	2	1	1	3
Min others fished with	1	1	1	1
Max others fished with	13	4	1	5
Households fishing with other permit holding households	34	7	4	6
Households recording harvest on a permit	36	8	2	6
Households owning a net				
Number	50	23	8	19
Percentage	56.2%	19.0%	38.1%	39.6%

Source ADF&G Division of Subsistence household surveys, 2013.

[a] Percentage of households reporting use of setnet for subsistence fishing.

For the Kodiak Island communities included in this study, most respondents said that their harvest of salmon was less or the same in recent years. Like the three core case study communities, responses are not expanded and the number of households shown is the number surveyed. Figure 4-19 shows that among subsistence permit holders in Kodiak only about a third said that their harvest was less in recent years and most said they harvested about the same. There was a similar response for Old Harbor as

well. Only Larsen Bay shows a dramatic decline in harvest compared to recent years. For those that responded less, households were asked why they harvested less. The communities are drastically different in size and the sample in Kodiak was 100 of each sample strata. This creates a more complex sampling strategy than that used in the three core study communities and in the Chignik area communities. Therefore, Figure 4-20 shows the percentage of responses per category, instead of the number of responses. Personal reasons were the main responses such as working or not having time to participate in fishing, or family or other personal reasons. In Larsen Bay, where a majority of residents said they harvested less in 2012, lack of resources was a main concern. Kodiak is a large island with a complexity of systems that support salmon runs with great variability in spawning and rearing habitat for salmon as well as communities spread out across the island near these systems. Each community demonstrates variability in social factors that also affect subsistence production. Interestingly one of the responses to an assessment question in this study is that there is less sharing of resources among the general population in Kodiak as well as in Larsen Bay and Old Harbor. As noted earlier among the general population in Kodiak, many households in this sample reported receiving salmon and therefore may be more dependent on receiving salmon annually to meet their household goals.

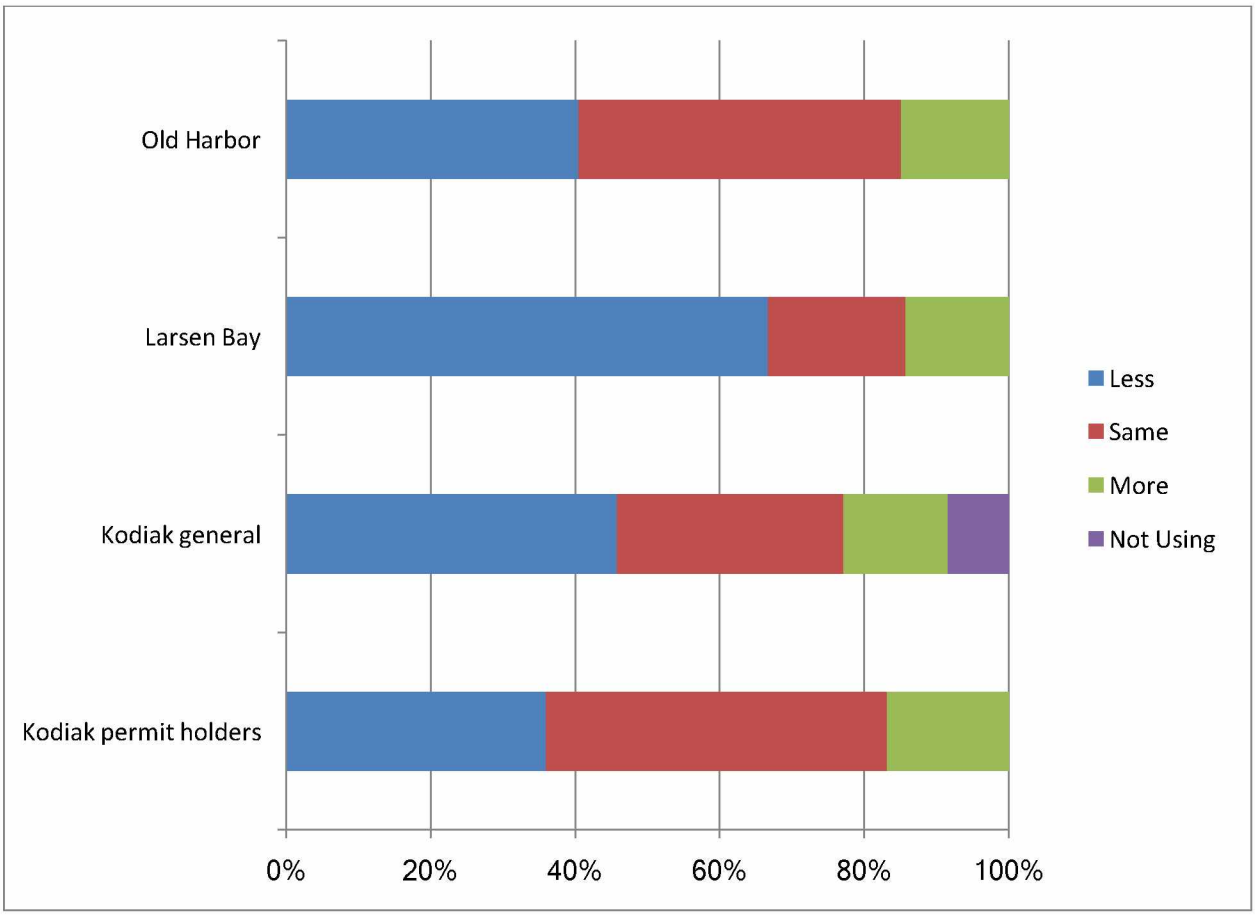

Figure 4-19. Respondents use of salmon in 2012 compared to recent years, Kodiak area communities

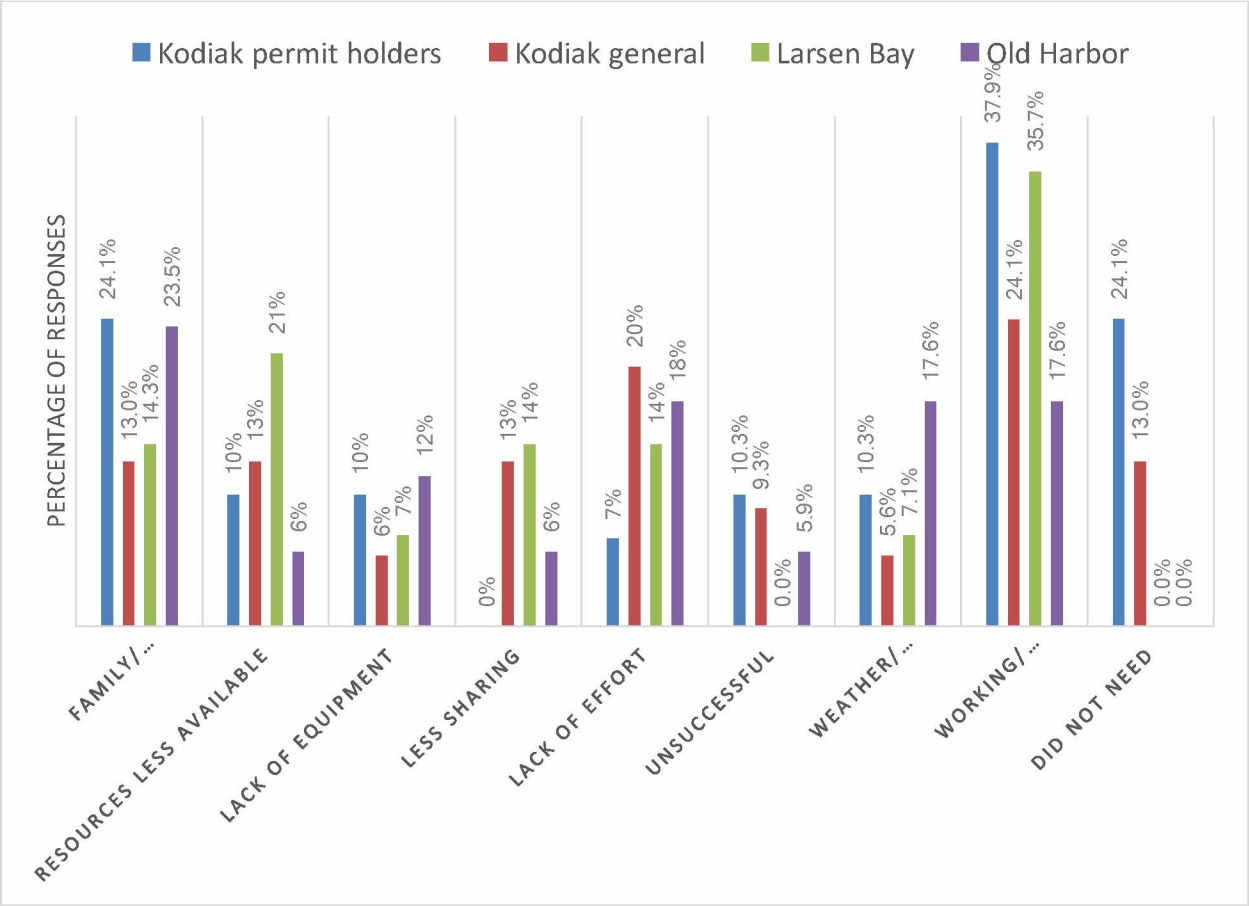

Figure 4-20. Reasons respondents gave for more use of salmon than in recent years, Kodiak area communities

SOUTHEAST ALASKA

In Southeast Alaska, salmon were and continue to be an important resource for residents for both commercial fishing as well as subsistence (Langdon 1989; Holen, et al. 2014; Sill, et al. 2017). Southeast Alaska is composed of many large islands that provide shelter for small boats in the marine waters for harvesting salmon by rod and reel, as well as in abundant rivers and streams where salmon can be harvested using gill nets and seine gear (Holen, et al. 2014). In 2013, surveys were conducted in the communities of Angoon (pop. 416), Haines (pop. 1,805), Hoonah (pop. 787), Hydaburg (pop. 405), and

Whale Pass (pop. 39) (ADLWD 2015) (Figure 1-1). This project surveyed a diversity of communities throughout Southeast Alaska that represent different size communities, geographic areas spanning the furthest north community of Haines to the south end of Prince of Wales Island, as well as the diverse culture of Southeast Alaska including predominantly Tlingit (Hoonah and Angoon), Haida (Hydaburg), and Euro-American communities (Haines and Whale Pass) (Sill, et al. 2017). Communities were also chosen that exhibit different involvements in commercial fishing. Haines for example has a large commercial fishing fleet, whereas Hydaburg and Hoonah have mixed commercial fishing economies, and Angoon and Whale Pass have become predominantly sport fishing destinations. This will be discussed in in more detail in Chapter 6 Economy.

The harvest of salmon varied greatly between these five diverse communities. The mean household harvest of salmon varied between 20 salmon in Angoon to 126 salmon in Hydaburg (Table 4-14). The per capita harvest ranged from 37 lb in Angoon, 47 in Haines, 52 in Whale Pass, 72 in Hoonah, to 214 in Hydaburg (Table 4-14). However, in terms of harvest and use, over 89% of households in all five communities reported using salmon, and anywhere from 57% in Whale Pass to 73% in Hydaburg reported harvesting salmon in 2012. Angoon has traditionally relied on salmon for subsistence; however, in recent years stocks have declined locally, especially sockeye salmon stocks in the Kanalku system nearby. During fieldwork conducted in Angoon in 2014, residents informed me that they were having a difficult time accessing streams further away from the community due to a decline in commercial fishing activity. Commercial fishing boats, especially seine and gill net boats are large and can easily traverse rough water. A decline in commercial fishing activity has limited the number of commercial boats available in the community that can be used to access fisheries such as Basket Bay across Chatham Strait, which can often be rough water (Holen, et al. 2014). Questions were added to

the survey regarding boat size and net ownership and findings will be discussed below. In 2012 in Angoon the per capita harvest was only 37 lb; however, residents shared their harvest widely with 76% of households receiving salmon and 47% giving away salmon.

Table 4-14. Estimated harvests and uses of salmon in Southeast Alaska, 2012

	Percentage of households					Harvest weight (lb)			Harvest amount			95%
Angoon	Use %	Attempt %	Harvest %	Receive %	Give %	Total	Mean household	Per capita	Total	Unit	Mean household	confidence limit (±)
Salmon	**92**	**65**	**65**	**76**	**47**	**12,709.0**	**104.2**	**37.2**	**2,393.7**	**Ind.**	**19.6**	**41.5**
Chum salmon	31	22	22	14	12	453.8	3.7	1.3	67.5	Ind.	0.6	52.8
Coho salmon	61	45	45	35	27	4,279.4	35.1	12.5	892.9	Ind.	7.3	58.6
Chinook	76	39	35	51	27	3,288.7	27.0	9.6	350.3	Ind.	2.9	56.7
Pink salmon	25	18	18	12	6	424.3	3.5	1.2	162.8	Ind.	1.3	70.2
Sockeye	75	39	37	53	35	4,262.9	34.9	12.5	920.2	Ind.	7.5	45.2
Haines												
Salmon	**92**	**66**	**64**	**58**	**44**	**89,526.0**	**109.4**	**46.6**	**18,372.9**	**Ind.**	**22.5**	**30.7**
Chum salmon	27	20	20	7	8	6,198.2	7.6	3.2	921.4	Ind.	1.1	48.1
Coho salmon	37	29	28	11	10	6,254.6	7.6	3.3	1,305.1	Ind.	1.6	37.7
Chinook	58	42	36	28	17	12,958.8	15.8	6.7	1,380.2	Ind.	1.7	51.6
Pink salmon	31	29	28	5	7	5,915.9	7.2	3.1	2,270.0	Ind.	2.8	43.0
Sockeye	82	56	54	46	37	57,887.2	70.8	30.1	12,496.2	Ind.	15.3	33.4
Hoonah												
Salmon	**89**	**66**	**61**	**63**	**51**	**52,702.3**	**188.2**	**72.0**	**9,947.4**	**Ind.**	**35.5**	**32.0**
Chum salmon	30	23	20	12	14	4,861.5	17.4	6.6	722.7	Ind.	2.6	49.1
Coho salmon	72	57	52	39	41	16,721.9	59.7	22.8	3,489.2	Ind.	12.5	25.2
Chinook	70	43	37	44	30	12,310.1	44.0	16.8	1,311.1	Ind.	4.7	56.6
Pink salmon	29	23	22	10	11	2,169.3	7.7	3.0	832.4	Ind.	3.0	41.1
Sockeye	52	28	22	38	25	16,639.6	59.4	22.7	3,592.0	Ind.	12.8	53.0
Hydaburg												
Salmon	**100**	**73**	**73**	**90**	**71**	**71,234.6**	**598.6**	**214.4**	**14,945.5**	**Ind.**	**125.6**	**29.7**
Chum salmon	25	19	17	13	17	4,786.1	40.2	14.4	711.5	Ind.	6.0	109.1
Coho salmon	58	42	42	31	35	10,643.0	89.4	32.0	2,220.8	Ind.	18.7	47.9
Chinook	88	46	46	67	46	6,540.7	55.0	19.7	696.6	Ind.	5.9	40.1
Pink salmon	21	17	17	8	8	4,005.8	33.7	12.1	1,537.1	Ind.	12.9	79.0
Sockeye	98	63	63	63	65	45,259.1	380.3	136.2	9,779.5	Ind.	82.2	31.6
Whale Pass												
Salmon	**95**	**62**	**57**	**57**	**48**	**2,867.7**	**106.2**	**51.9**	**568.3**	**Ind.**	**21.0**	**27.9**
Chum salmon	5	0	0	5	5	0.0	0.0	0.0	0.0	Ind.	0.0	0.0
Coho salmon	76	52	48	38	43	2,168.9	80.3	39.2	452.6	Ind.	16.8	30.0
Chinook	57	29	24	33	14	398.4	14.8	7.2	42.4	Ind.	1.6	57.9
Pink salmon	10	10	10	0	5	50.3	1.9	0.9	19.3	Ind.	0.7	80.1
Sockeye	10	10	10	0	0	250.1	9.3	4.5	54.0	Ind.	2.0	74.3

Source ADF&G Division of Subsistence household surveys, 2013.

Chinook salmon were one of the most highly shared species in all five communities. Residents harvest fewer of this species, often harvested using rod and reel in the winter and early spring fishery in marine waters. During research conducted in Hoonah in 2014, respondents told me that they usually only need

6-8 of these fish a year for household consumption and therefore they share the rest of their harvest widely within the community. Chinook harvested in the marine waters of Southeast Alaska are large salmon, as compared to other areas of Alaska (CSIS 2015). In 2012, sharing was highest in Hoonah for Chinook salmon with 44% receiving salmon and 30% giving away salmon. Interestingly, although Hydaburg had a high per capita harvest, there was also a significant amount of sharing between households with 90% of households receiving salmon and 71% giving away salmon.

In all five communities, combined sockeye salmon represented a majority of the harvest in terms of number of fish harvested: 58% overall was sockeye salmon, coho salmon 18%, Chinook salmon 8%, pink salmon 11%, and chum salmon 5% (Figure 4-21). Because Chinook salmon are much larger than other salmon, it's also important to look at the harvest in terms of per capita harvest, or edible weight. For example, salmon harvested in the Kanalku system by residents of Angoon are much smaller than sockeye found in other river systems in Southeast Alaska. However, overall sockeye salmon are still the most harvested salmon in terms of pounds per capita harvested (49%), followed by coho salmon (26%), then Chinook salmon (14%), chum salmon (6%), and pink salmon (5%) (Figure 4-22).

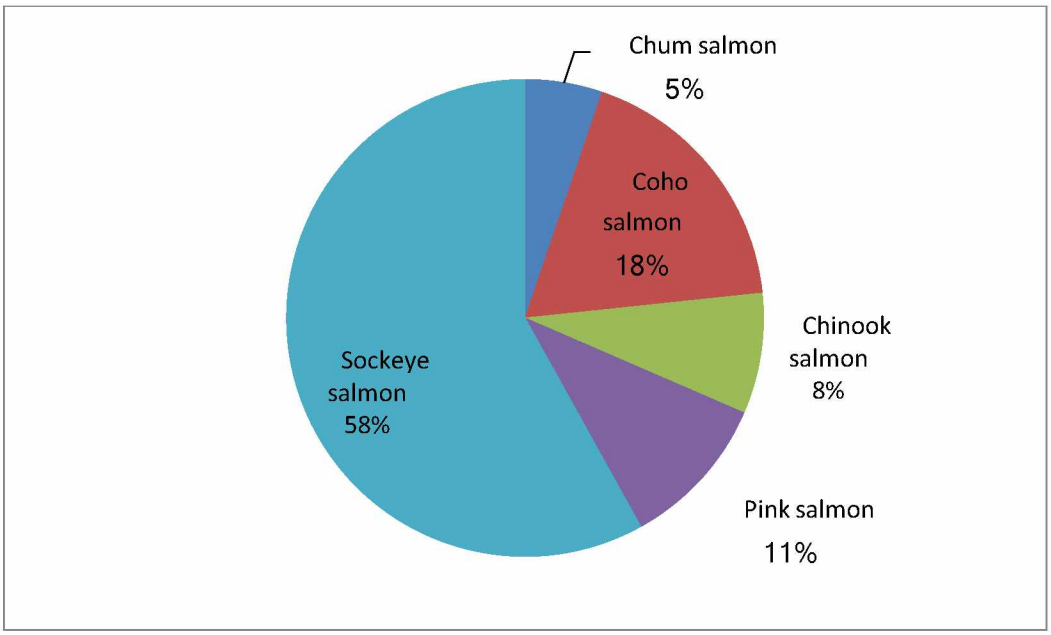

Figure 4-21. Percentage of salmon harvested by number of fish, Southeast Alaska communities combined, 2012

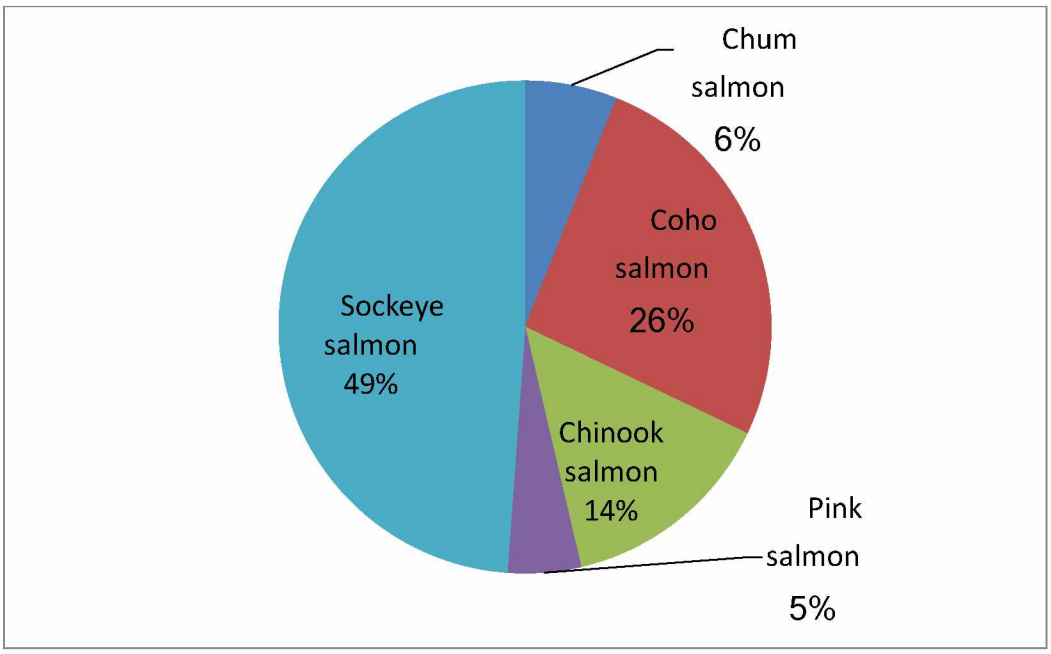

Figure 4-22. Percentage of salmon harvested by weight, Southeast Alaska communities combined, 2012

Harvest of salmon is mainly by beach seine near the communities or by set gill net. Table 4-15 shows the number and percentage of households in each community that owned a net in 2012, shared a net, and the average number of households with whom the net was shared. Overall net ownership was highest in Haines with 50% sampled households owning a net and lowest in Whale Pass with 11% owning a net. Although there are a great number of salmon streams in Southeast Alaska, subsistence salmon fisheries are highly regulated including location, gear type, and restrictions on bag limits (Holen, et al. 2014). There are greater opportunities for subsistence salmon fishing near Haines than there are near Whale Pass where residents often harvest salmon by rod and reel. In addition to Haines, the other study communities of Angoon, Hoonah, and Hydaburg also have nearby subsistence salmon harvesting opportunities where a net can be used. In Hoonah 22% of households owned a net, 39% in Hydaburg, and 50% in Haines. The community with the highest percentage of net sharing was Hydaburg where 27% of households reported sharing a net, and of those households reporting that they shared a net, the net was shared with an average of 7 other households. Net sharing was low in Hoonah, where only 11% of households reported sharing a net, however, for those that did share a net it was shared with 5 other households (Table 4-15).

Table 4-15. Household sharing of nets, Southeast Alaska, 2012

		Households owning a net			Households sharing a net			Average number of households
Community	Sampled households	Valid	Number	Percentage	Valid	Number	Percentage	net was shared
Angoon	51	47	5	10.6	47	4	8.5	2.0
Haines	132	128	64	50.0	123	28	22.8	1.5
Hoonah	122	119	26	21.8	111	12	10.8	5.1
Hydaburg	48	46	18	39.1	45	12	26.7	7.0
Whale Pass	21	18	2	11.1	18	0	0.0	0.0

Source: ADF&G Division of Subsistence household surveys, 2013.

As noted above commercial fishing has declined in recent years in some Southeast Alaska communities, especially Angoon. Each community is geographically different and therefore harvesting opportunities can sometimes be close to a community or relatively far away with varying degrees of complexity in the regulations (Holen, et al. 2014). In addition, there are also differences in the size and/or type of a boat necessary for accessing subsistence fishing locations. Table 4-16 details boat ownership statistics for the five study communities. Boat ownership at the household level ranged from 48% in Hydaburg to 90% in Whale Pass. Hoonah had the highest reported ownership of a commercial fishing vessel (18%) while there were no commercial vessels in Whale Pass. In Angoon, 12% of households owned a commercial fishing vessel, and for the rest of the community most boats (32%) were under 20 feet, meaning only 12% of the community had larger boats that could access more abundant fisheries located further from the community. As noted above, nearby Kanalku River sockeye are smaller fish relative to other Southeast stocks, whereas further from the community more abundant stocks composed of larger fish can be found. However, travel to these areas necessitates a larger vessel for access as sometime rough marine waters need to be traversed in order to access these locations (Holen, et al. 2014). Sport fishing lodges in Angoon have become economically important in recent years employing guides and support service jobs. In addition, at least two guide services are owned by past or current residents. Interviewing guides in 2013 I found that they are proud of being able to provide employment opportunities to local residents. This change to economy of the community, also changes the community identity away from a commercial fishing town to one based on sport fishing services. Hoonah had larger boats with 27% of residents owning a boat less than 20 feet and 12% between 20-24 feet. Haines had the largest diversity of boats; however, it also has a larger population.

Table 4-16. Boat ownership by vessel type or length, 2012

		Estimated number of households owning boats		Estimated number of households owning a boat by type											
				Commercial		Less than 20 ft		20–24 ft		Greater than 24 ft		Other type		Unknown length or type	
Community	Total households	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Angoon	122	56.1	46.0%	14.6	12.0%	39.0	32.0%	2.4	2.0%	0.0	0.0%	0.0	0.0%	0.0	0.0%
Haines	818	520.0	63.6%	107.8	13.2%	285.3	34.9%	69.8	8.5%	19.0	2.3%	12.7	1.6%	25.4	3.1%
Hoonah	280	174.4	62.3%	50.5	18.0%	75.7	27.0%	34.4	12.3%	4.6	1.6%	0.0	0.0%	9.2	3.3%
Hydaburg	119	56.9	47.8%	7.8	6.5%	41.4	34.8%	5.2	4.3%	0.0	0.0%	0.0	0.0%	2.6	2.2%
Whale Pass	27	24.3	90.0%	0.0	0.0%	20.3	75.0%	2.7	10.0%	0.0	0.0%	1.4	5.0%	0.0	0.0%

Source: ADF&G Division of Subsistence household surveys, 2013.

For the communities in Southeast Alaska, a majority of households responded that their harvest of salmon was less or the same in 2012 than in recent years (Figure 4-23). The one community that a majority of respondents noted a significant change was Angoon where 70% said they used less salmon than in recent years. In Hoonah as well 50% noted a reduction in their harvests. Like the core case study communities, responses are not expanded and the number of households shown is the number surveyed. Most responses for the Southeast Alaska communities as to why respondents used less salmon in 2012 than in recent years had to do with personal reasons such as family, lack of effort in the fishery, or working during fishery openings (Figure 4-24). Interestingly, residents noted that there was less sharing of salmon especially in Haines. Except for Whale Pass, where residents mainly harvest their salmon in the sport fishery, there were responses that residents were using less salmon than in recent years because there was less sharing. Resources being less available were highest in Angoon which also noted a significant decline in their salmon use. The other category in which Angoon residents noted why their harvest was less than in recent years was they were working and didn't have time to harvest.

Summer economic activities in the community, especially in the sport guiding business, which often mean that residents have few days off to fish for their subsistence needs.

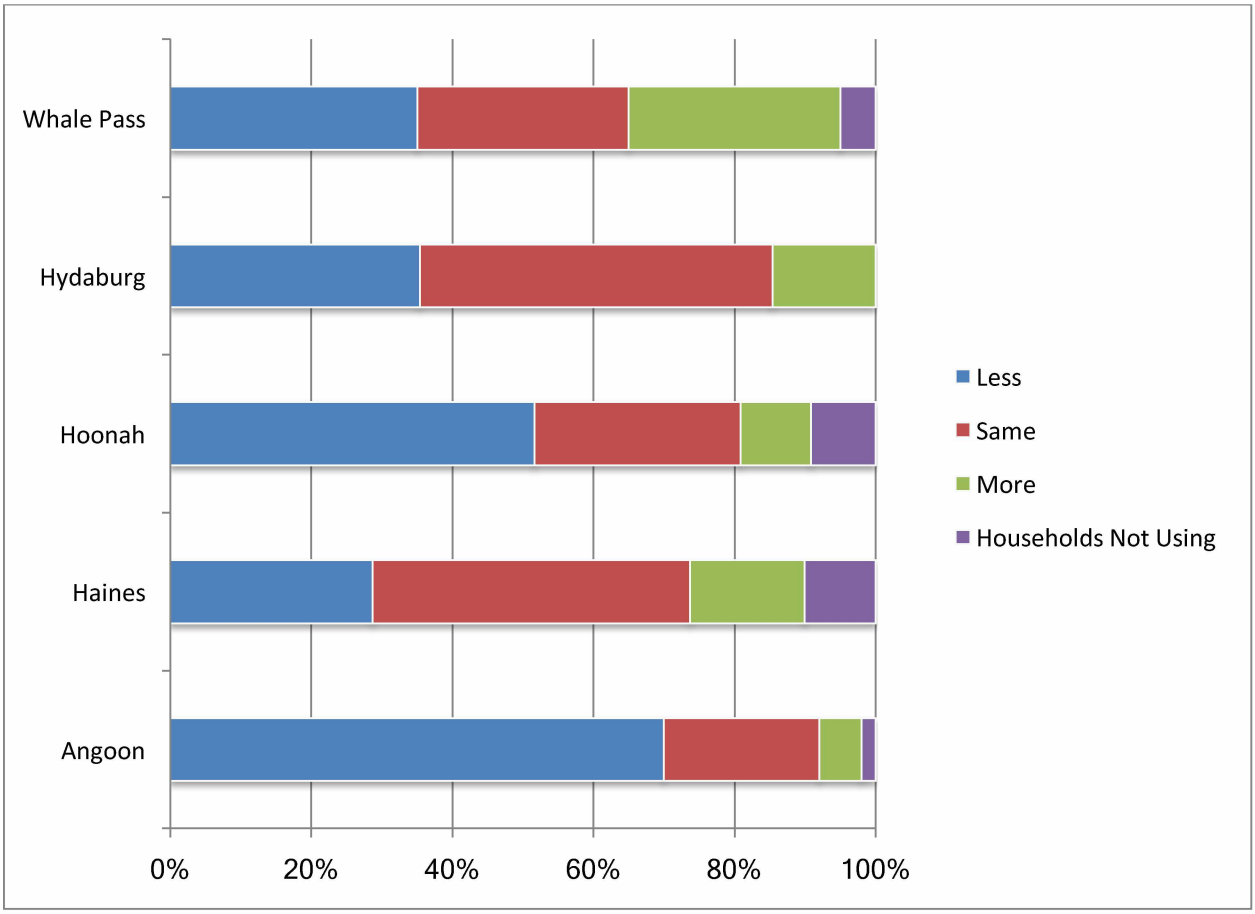

Figure 4-23. Respondents use of salmon in 2012 compared to recent years, Southeast Alaska communities

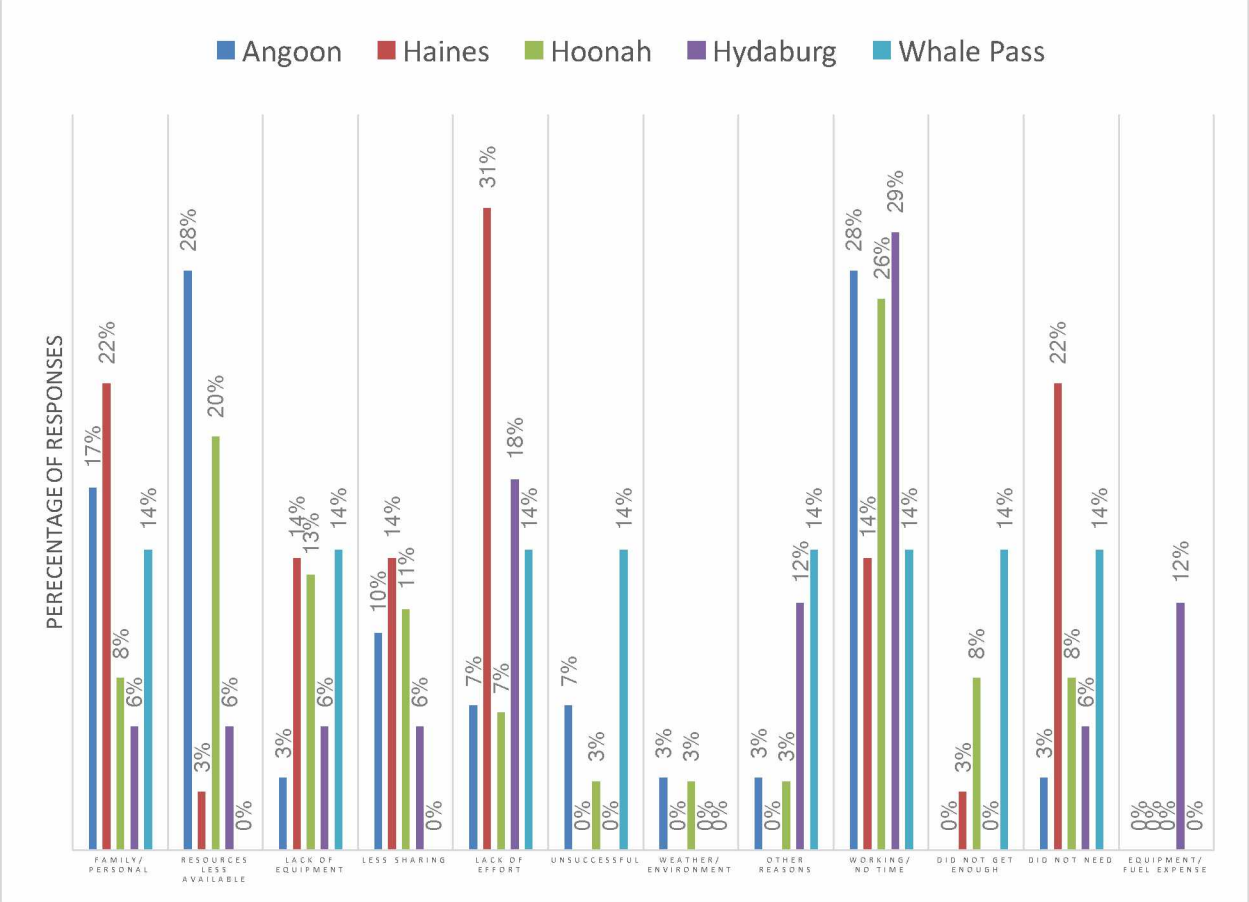

Figure 4-24. Reasons respondents gave for more use of salmon than in recent years, Southeast Alaska communities

CHALLENGES IN THE SUBSISTENCE FISHERY

Looking back at Figure 2-2 that shows the harvest composition by region in Alaska, Southwest Alaska where the Chignik Area communities are located, reports that harvest of salmon is significant overall with salmon composing 50% of the overall harvest in pounds edible weight. This is somewhat lower in Kodiak at around 38%, where residents have access to ice free marine waters year-round and can participate in winter fisheries for other marine species such as halibut, cod, and shellfish. Southeast

Alaska is similar with a salmon harvest composition of 30%. Although there are differences in harvest amounts, there is still participation by all communities in salmon fishing at the household level. There is also a high degree of sharing in most communities.

When I spent time in Tyonek in 2004 conducting research for an ethnography of West Cook Inlet, I was fortunate enough to be invited into several fish camps (Stanek, et al. 2006:97-99). At Robert's Creek on the shore of Cook Inlet is the fish camp occupied by the late Robert Standifer, and his siblings Harriet, Art, and Ernie. As noted earlier, Harriet is the matriarch of the fish camp and fishing usually occurs when Harriet is present so that she can ensure the successful harvest and processing of the salmon. As mentioned earlier, processing Chinook salmon takes skill and knowledge. In images I took for the ethnography, Harriet's daughter Connie makes the first cuts with the assistance of her son, gutting and heading the fish. It is then passed on to a family member for the first fillet to be cut and finally around the table to Harriet who will make the final cut to ensure the proper thickness so it won't spoil in the smokehouse. Salmon harvested at this camp will be shared with extended family, others in the community, and with family outside Tyonek in Anchorage and the Mat-Su Valley communities where several family members now reside. Many of the family members have commercial fished at various times but have since gotten out of the fishery and now only subsistence fish. However, even when they still participated in commercial fishing, families would begin their season subsistence fishing. Only when enough fish were harvested for personal consumption and the smokehouses were full, did they then begin to commercial fish.

Fish camps have been an important part of life in Tyonek for generations and many residents spend the summer at their fish camps even though the village is less than 20 minutes away for most of them via the large network of roads in Tyonek. Figure 4-25 shows the location of Chinook salmon harvests in

2013 near fish camps and the Tyonek road system (Jones, et al. 2015). According to one resident, Angela Peter, there are residents who fish near town, but there are few sites available in the area and most fishing has to be conducted further from town at fish camps. Regulations specify that fishnets must be at least 300 feet apart and the rocky beach and mudflats sometimes limits where residents can set a net. Regardless fish camps have been established in most locations for several generations, long before contemporary regulations.

Angela related that over her lifetime, the abundance of Chinook salmon has decreased. She said that in recent years it has been difficult to meet harvesting goals. Each year is unique. When I interviewed her in July 2013 she said three years prior almost no Chinook were harvested by fishers in the community, the following year there were poor harvests as well but a few fish were harvested, and in 2013 residents were mostly able to meet their harvesting goals. Most residents fish close to town if locations are available, but she fishes at her husband's traditional fish camp further down the beach. There are just not enough locations close to town and now they have to deal with boats coming from Anchorage and Kenai anchoring their nets too close to nets set by Tyonek fishers. The entirety of the beach in the Tyonek Subdistrict Subsistence fishery is owned by the Native Village of Tyonek and is private property; however, any Alaska resident can fish the Subdistrict as long as they do not land on the beach, which constitutes trespassing.

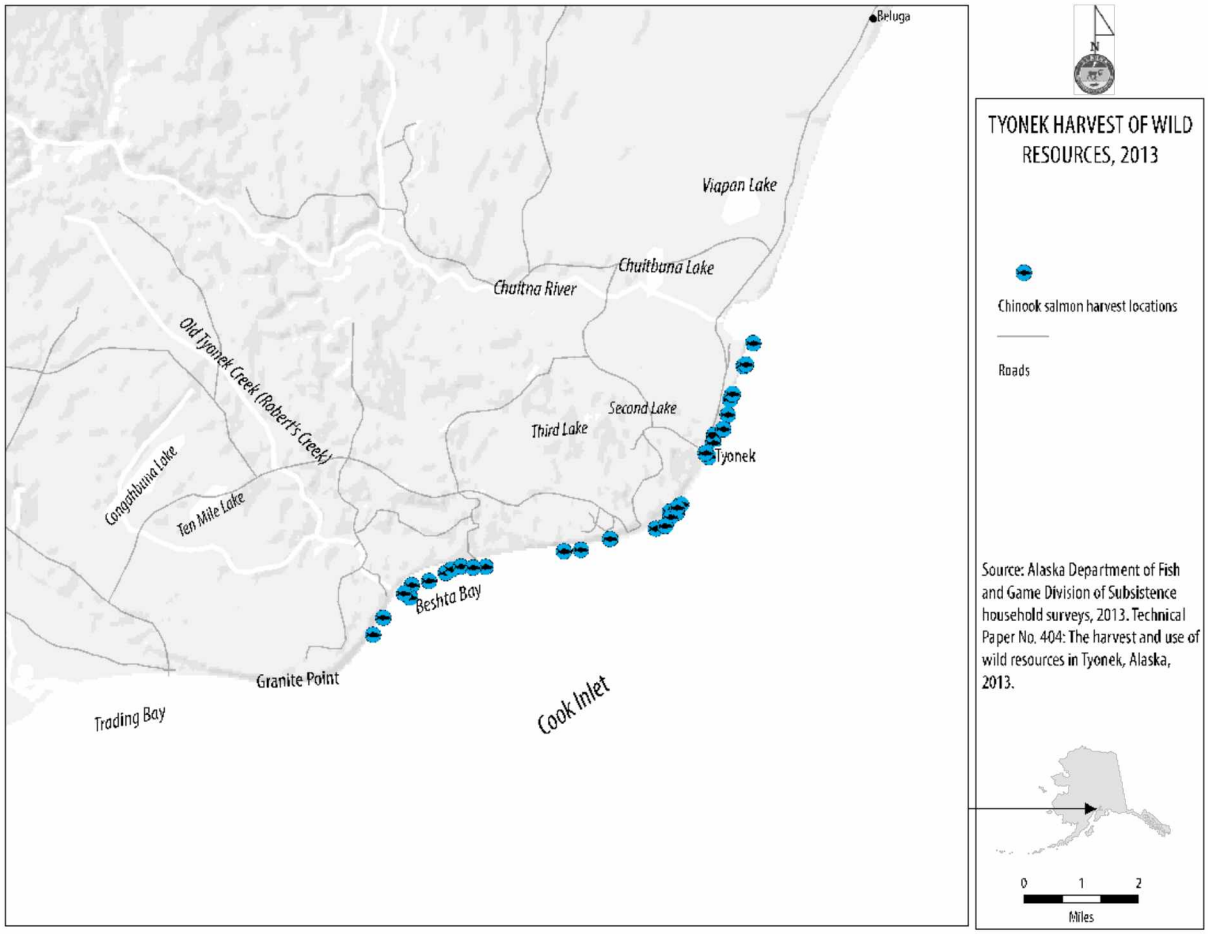

Figure 4-25. Chinook salmon harvest locations, Tyonek, 2013

Source: Jones et al., 2015

John Standifer has lived in Tyonek all his life and has been commercial fishing since he was seven years old; yet he has been subsistence fishing as long as he can remember. He was born at his family's fish camp and he remembers that his midwife only spoke Dena'ina; today few fluent Dena'ina speakers remain. He said that salmon fishing is important to him because it's a way of life. He can't remember a time when he didn't fish.

In Kokhanok, Charlene Roehl fishes using a net along the shore near the community. She has an 18-foot boat common to the area that she uses to check her nets. She typically uses the same location to fish annually as she has come to know this location well. Over a lifetime of fishing at this location, Charlene has learned to read the winds and how best to set the net depending on the weather; if the winds are blowing too strongly in one direction she will place her net on the opposite side of the beach. She learned how to subsistence fish from her parents. Everyone in her immediate family participates in subsistence fishing together if they are in the community at the time. Her children are now grown and participate in commercial fishing in Bristol Bay as the season overlaps when the salmon are present in Iliamna Lake to subsistence fish, so they no longer help with the subsistence effort. This means that those in the community who are present to participate in the subsistence fishery need to harvest enough for everyone's needs for the winter. This is common in Iliamna Lake communities. In one case observed in neighboring Newhalen, a single fisher was responsible for harvesting salmon for several people in the community whose family members were in Bristol Bay fishing at the time or working on the nearby Pebble Project. The fisher's job was to pick the nets and deliver the harvest to their fish bins. In return he received processed jarred salmon for his efforts (Holen 2011:195).

As noted earlier, the community of Kokhanok consistently harvests more salmon per capita than other communities in the state (Fall, et al. 2014). Charlene says that fishing for subsistence is important for her household to meet their needs for food; she tries to "put up" (harvest and process) 1,000 salmon a season that is then split across three households, all recorded on one permit. Another longtime resident of Kokhanok, Gary Nielsen, related how subsistence fishing is important for the community. His household mainly relies on hunting for subsistence and only about 5% of their diet is salmon. However, he said that in the community regardless everyone participates in fishing in some way and that his

household isn't typical. Regardless of his household's lesser use of salmon, it's still important to the community overall.

In Chenega Bay, a longtime resident noted how other marine resources such as halibut are more important in the diet. He said that fishing for salmon is now more of a traditional activity and not really necessary. The population of the community has slowly diminished over time and eventually he thinks most people will just have their summer homes in Chenega Bay. For residents who live in Chenega Bay year-round though, he said it still feels like a fishing community and salmon fishing for home use is an important activity in the summer. There are considerable kinship relations between Chenega Bay and other larger communities in Prince William Sound such as Cordova and Valdez. Many former residents of Chenega Bay who are active commercial fishers have migrated to Cordova and Valdez, or now live in Anchorage, leaving the community with fewer residents with strong fishing skills and equipment. As noted earlier, Chenega Bay is not a set net fishery within easy access to the community, it is a drift net subsistence fishery and residents need larger equipment to access fishing sites and the knowledge necessary to be successful in the fishery. There are few boats tied up to the docks in Chenega Bay today. Despite this, for those that have remained in the community there is still a high level of participation in harvesting salmon for home use with 81% of households harvesting salmon (Table 4-2) with a per capita harvest of 136 lbs, almost the same as Tyonek with 82% of households harvesting salmon and a per capita harvest at 141 lbs (Table 4-4).

Each community has unique challenges. Abundance of salmon in Bristol Bay and Prince William Sound continues to be high relative to other areas; however, Chinook salmon have declined in some areas of the state especially in Cook Inlet (Team 2013). Angela Peter noted that over her lifetime, Chinook salmon abundance has decreased. Chinook salmon harvests have generally declined over time with a

historical average harvest of 1,233 to a 2012 harvest of 840 for the entire subsistence fishery in Tyonek (Fall, et al. 2014). Tyonek is unique in this study compared to other coastal communities as Chinook composes the greatest component of salmon harvests. When the Chinook salmon were more abundant, residents would harvest almost entirely Chinook for subsistence, and once the sockeye started returning they would cease subsistence fishing and switch to commercial fishing. Today due to low Chinook salmon returns, greater reliance is placed on harvesting sockeye salmon, which presents some challenges as traditional processing methods are attuned to processing the thicker oilier Chinook than sockeye or coho salmon.

Art Standifer of Tyonek noted that over his lifetime the abundance and health of Chinook salmon has changed. In the 1970s, his family pulled in 10-15 salmon in a single set and now they are lucky to get one. Community leaders recognize these challenges and have worked through locally initiated organizations to ameliorate the spawning habitat for Chinook salmon.

During interviews, it was obvious that people in Tyonek feel an especially deep connection to the Chinook salmon especially and want to ensure the success and survival of the fishery and the fish. Recent efforts include the Tyonek Tribal Conservation District, which has two fish passage projects. According to Art, the first was completed in 2014 and restored 7.5 miles of spawning and rearing habitat on Tyonek Creek. This involved removing impediments to fish passage. The next project, for which they are seeking funding for, is to restore 8.5 miles of habitat on Robert's Creek. The building of roads and floods destroyed this fish passage. A flood occurred in 1986, which also wiped out spawning and rearing habitat on the Chuitna River, at the northern edge of the Tyonek Subdistrict subsistence fishery. The habitat has recovered and residents watch this river closely as it is also an important spawning location for coho salmon. There is a concern by residents as to the fate of the Chuitna River as recent

development plans call for a coal mine to be developed in the area and some of the river would be moved (Stanek, et al. 2007).

This worry and challenge to subsistence fishing is echoed in the community of Kokhanok as for over 10 years they have faced the prospect of an open pit copper, gold, and molybdenum mine in the area, a prospect called the Pebble Mine which has been highly contentious (Krieg, et al. 2009). During interviews in Kokhanok, a resident told me "we all drink this water," meaning the fish, the animals, local residents, everyone (Holen 2011; Krieg, et al. 2009). Residents note that they need jobs, but ponder how to balance an ecosystem that provides such high abundance of salmon with a mine (Holen 2011). The experience of Chenega Bay and other Prince William Sound communities provides a cautionary tale of trying to balance development within a fragile ecosystem.

The community of Chenega Bay experienced the effects of natural resource development on the subsistence economy. Resource harvests of salmon had been fairly consistent since the community was reestablished in 1983 until 1989 when the Exxon Valdez spilled crude oil throughout Prince William Sound. Figure 4-26 shows that harvests of salmon and all wild resources were low in 1989 and 1990 following the spill. Salmon being a migratory species instead of a resident species were relied upon for subsistence and from 1991 to the present have provided a higher level of dependence relative to other species, except nonsalmon marine fish which have also recovered. Herring, a once abundant resource in Prince William Sound and an important forage fish to resident and migratory species alike, crashed following the oil spill and is only now recovering.

Chenega Bay was included in this study as it is a case in which a human induced natural disaster, the Exxon Valdez Oil Spill (EVOS) event severely disrupted the subsistence harvest in Prince William Sound. The spill caused environmental degradation, but it also created a social disruption as well with many of

the region's residents engaged in cleaning up the spill for several years after the event. Annual harvest patterns that had been established over years were disrupted and it took time for these harvest patterns to be reestablished in many Prince William Sound communities. What is interesting about Chenega Bay is that within a few years of the EVOS event, once the beaches had been scrubbed and the oil skimmed off the surface and the rest left to natural forces to break up, residents returned quickly to harvesting marine resources. As shown in Figure 4-26, harvest efforts are at even higher levels several years following the EVOS event, except for marine mammals. Salmon and nonsalmon fish, such as halibut and rockfish, became a greater component of the diet.

Today in Chenega Bay, two residents interviewed for this project who are roommates, Dennis Zachar and Tom Shermen continue to subsistence fish for salmon and other marine species including rockfish and halibut. Dennis has a skiff and Tom no longer owns a boat. Dennis keeps his boat in the water year-round in order to fish. He fishes for halibut and rockfish mainly from the skiff. Residents in rural Alaskan communities can participate in subsistence halibut fishing through a federal program by getting a subsistence halibut registration certificate (SHaRC) from the National Marine Fisheries Service which allows for a liberal bag limit. They both also participate in salmon fishing with other residents sharing a net. They feel that they get enough salmon one way or another to meet the needs of their household. They supplement different species of salmon when they do not get enough sockeye or coho. According to Tom "there is usually enough salmon going by here, that you can get enough one way or another." As shown in Figure 4-26, salmon today are an important part of the annual subsistence harvest in Chenega Bay.

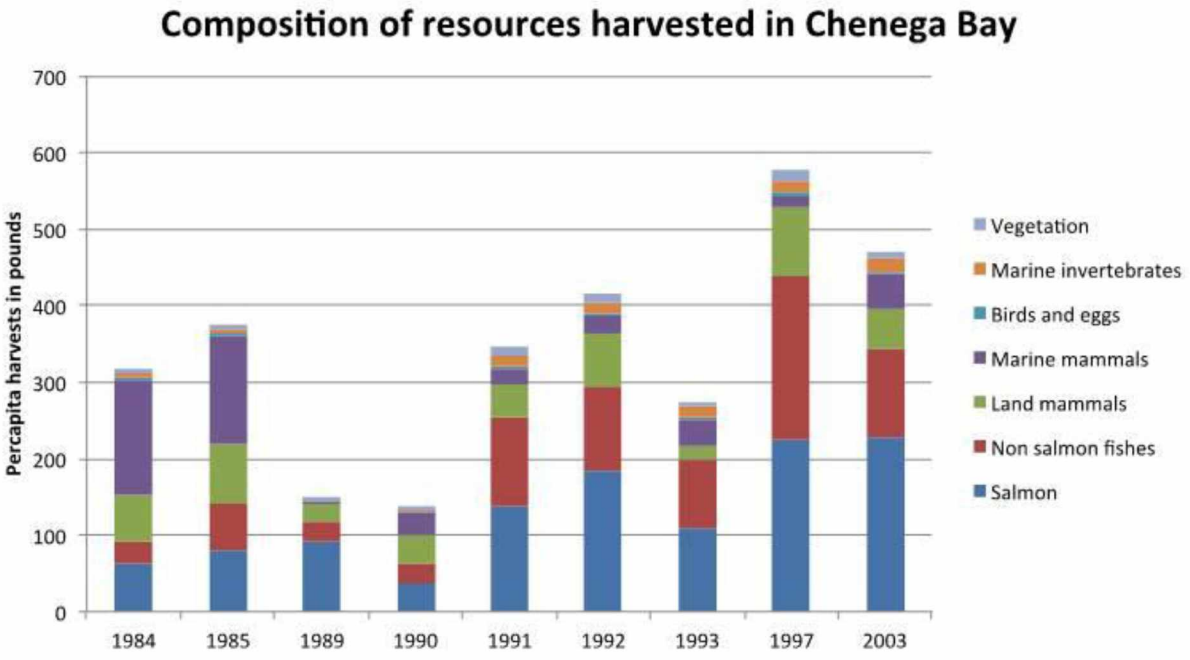

Figure 4-26. Harvest of wild resources over time, Chenega Bay 1984-2003

CONCLUSION: SUBSISTENCE

In all three of the core study communities, as well as in the comparative communities located in coastal Alaska, expect in a few cases such as Angoon, fishing for subsistence salmon meets household harvesting goals. There is high participation in fishing in all of the communities as well as a high degree of sharing. Salmon provides adequate food security in each of the study communities. In Tyonek, Angela Peter says that she has been subsistence fishing most of her life, at least 30 years. She believes that salmon is the most important component of her household's diet. "We have always been able to get salmon, of course moose meat is the other one that is important; but you do not get a moose every year, so salmon at least you are sure to get some sort of salmon." Chinook salmon is her most valued

salmon; she mainly puts away Chinook. "I have to get Kings [Chinook], it is the preference of our family and the main food source for us, you know we can it, freeze it, salt it, we kipper it, we smoke it." It comes to the table in many ways throughout the year.

Harriet Kauffman says that she has been subsistence fishing "since it started;" when the subsistence fishery was reestablished in Tyonek in the early 1980s (Fall 1989). Harriet fishes for Chinook and coho salmon in the subsistence fishery to meet her household's harvesting goals. "I keep everything I get, there's always someone else who could use a fish that I do not eat or use." Harriet continues to fish with her brother Ernie and Art each summer. Art says that the three of them go each year to fish together, it's' part of what they do to meet their subsistence needs but it's more than that. For Art, subsistence fishing for food is very important but it is also important for "cultural reasons, for family and tradition." This idea of salmon being part of culture, part of the learned and shared way of being, will be explored next.

Chapter 5 – CULTURE

Participating in salmon fishing is an expression of a subsistence way of life embedded in culture; people learn and share ways of being within an extended family, community, and culture through their relationship with salmon (Holen 2011:187; Carothers 2012; Koester 2012; Boxberger 1989). These relationships benefit community and cultural well-being, and are often predicated on a cultural keystone species (Garibaldi and Turner 2004:4; Poe et al. 2014:170). As noted in Figure 4-1, residents of the three core study communities all find salmon to be important in terms of subsistence and commercial fisheries. This chapter will discuss how salmon and the participation in salmon fishing is important for the subsistence way of life. As shown in Figure 5-1, there are many reasons why residents continue to live in their communities. These include a sense of home or place, the subsistence lifestyle, family, culture, and a sense of freedom. Being able to fish, hunt, and gather on one's ancestral waters and lands embodies many of these responses; people desire to be with and participate alongside family in harvesting activities in a landscape where there is a deep-felt sense of connection. Although many residents did not express this sentiment of freedom directly in the surveys, freedom, or living in a place that allows one to direct their own destiny for themselves and their family, came out in many of the key respondent interviews.

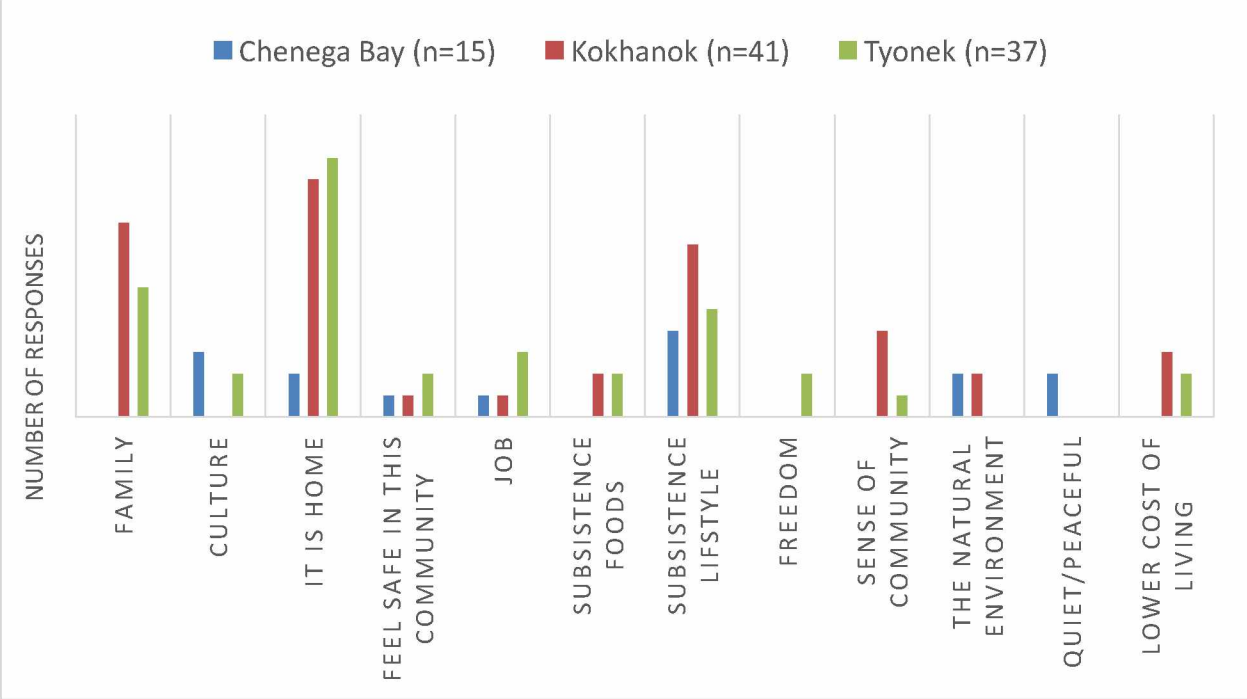

Figure 5-1. Reasons to continue residing in the community, Chenega Bay, Kokhanok, and Tyonek

This chapter will explore the subsistence salmon fishery in Chenega Bay, Kokhanok, and Tyonek and why residents continue to live in their communities. These reasons include salmon fishing as a part of culture, freedom, family, place and identity, and the politics involved in salmon fishing. The exploration of these topics is driven by what came out of the open-ended qualitative interviews. In many ways, these topics are what residents chose to talk about when posed with questions of what salmon fishing and living in their community means to them. This chapter attempts to express why it is that residents of these three communities continue to live in their home community, and what these communities mean to them.

Salmon fisheries were chosen for this project as they provide a great deal of the food security in each community. In addition, fishing for salmon is a family and community activity undertaken during a short period of time each summer. Salmon are also interwoven into the identity of each community. As a species, salmon are highly symbolic. They are an abundant, attractive, bright, shiny fish coming in many colors and sizes. It would be difficult to make the same comparison of another species such as halibut or rockfish. Only herring, which occur in few places in Alaska, bring the same attention for similar reasons. But unlike herring, salmon in Alaska are abundant statewide, binding communities together.

SALMON IN CULTURE

As noted in Table 4-1, the highest participation of individual salmon fishing comes from the communities of Kokhanok (64%) and Tyonek (67%), while only 36% of Chenega Bay residents participate in salmon fishing. Most of the discussion on the cultural importance of salmon fishing came from interviewees in Kokhanok and Tyonek.

Renee Zackar and her husband Greg rely on salmon each year to meet their subsistence needs. To them fishing for salmon is not only about putting fish in the pantry, it's about teaching their kids and getting them to work together. Renee and Greg were interviewed together and both agree that subsistence fishing is very important to their household. "Without it we wouldn't be able to live here, we wouldn't have enough food to feed our family," said Renee/Greg. They put up 500-1,000 salmon every year. They have five children and a mother in-law that lives with them. Subsistence is important for reasons beyond food. According to Renee, "To me it helps my kids form an identity, it lets them know that they can survive without things like food stamps and government handouts, and they can survive really well and have enough to eat if they are willing to work, because it is a lot of work. It also teaches them how

to work together." They said that as far as subsistence, the community is successful, but economically, jobs are scarce. They continue to live in the community because of the subsistence opportunities. Fish camp is vital for the family each year and Renee directs the harvesting and processing activities, while Greg focuses his efforts on fall and winter hunting activities, especially for moose and caribou. Both said though that for them Kokhanok is a subsistence community; it's a salmon fishing community.

Another Kokhanok resident, Gary Nielsen, says that he has been around fishing his entire life. He says that especially for residents over 40 in the community, fishing is quite important. "It's what we grew up with. We like the food, it's what we know. Even the younger generations know that salmon fishing is important," Nielsen said Edwin Zackar, who is in his 20s (no relation to Renee and Greg), grew up subsistence fishing with his grandmother. According to Charlene Roehl of Kokhanok, subsistence fishing has remained consistent in terms of participation by all ages. She says that she has observed the younger generation taking more of an interest in subsistence fishing. She thinks they are getting into it because "It is there. When the fish are in, it seems like everyone sticks a net in. I guess it must just be in our blood, a way of life."

Harvest and participation in salmon fishing in Kokhanok is high in terms of findings from this study and earlier studies (Holen and Lemons 2012). Roy Andrew of Kokhanok says that "The community is steadily growing; it is always going to be here." He thinks that both the commercial and subsistence fisheries will continue to be a large part of life for people. He continues to live in the community and works full time in the community. For him, if he did not have his current position he would return to commercial fish. It is hard to separate out how important salmon are for both commercial and subsistence fisheries; both fisheries are an important part of the continuity of the community. Roy says that salmon are an important symbol for the community. Salmon are their identity.

In Tyonek, Harriet Kaufman says that fishing for subsistence is important for meeting her food needs. She only eats store bought meat occasionally. She prefers salmon and will also eat moose if she is lucky enough to get a moose. "People fish as much as they can, because they may not be lucky enough to get a moose," Kaufman said, echoing a common comment by village residents. Most interviewees believe they can rely on the annual return of salmon. Kaufman thinks that fishing is important as a tradition and cultural experience. "It is a part that can be handed down through generations. Tradition is very important," she said.

Leonard Allowan said that in 2012 he did not get enough fish for his household needs, but in 2013 he did well; he harvested around 20 king salmon. He said he is "sitting pretty good right now," meaning that he has met his harvesting goals and this will get him through the winter. In the past, his family used to get more Chinook salmon during the subsistence harvest; harvesting more than 20 Chinook salmon annually. Leonard said that in 2013, although he was content with the harvest, it wasn't worth his time to set up a smoke house; he jarred or froze the salmon. He was hoping for a moose to make up the rest. "If you do not get enough fish you have to get a moose, if you do not get a moose, you have to have a lot of fish," he said. Moose are hunted in the fall after fishing so you have to do what you can to hedge your bets and get enough fish for the winter just in case you are not successful in harvesting a moose.

John Standifer, one of the major commercial harvesters in the community also has spent his life subsistence fishing. The subsistence fishery in Tyonek is open usually two weeks prior to the start of the commercial fishery. The commercial fishery has opened later each year to ensure that enough Chinook salmon migrate into their natal streams, protecting early Chinook salmon returns. Because of low abundance of Chinook salmon in upper Cook Inlet, the commercial fishery now targets sockeye and coho salmon. Residents focus their efforts in this early season on Chinook salmon for household needs,

getting what they need for the year for subsistence prior to focusing on commercial fishing. Once the king salmon have been harvested, cut, smoked, and put away for the year then they will focus their efforts on harvesting salmon for money. John has lived in Tyonek all his life. He was born at fish camp in Beshta Bay. He said that salmon is important to him as it is part of his way of life; his entire spring and summer are consumed with fishing.

Salmon fishing for these residents of Kokhanok and Tyonek is a way of life, a fundamental part of the annual cycle they live each year. These are fishing dependent communities, and salmon is the resource that they are most dependent upon. One resident of Chenega Bay, Darrell Totemoff, commented that: "fishing has not changed over time. It is a cyclical process, sometimes fishing is good and sometimes it is not so good, but it does not change that much." Other resources such as moose and caribou, which come in large packages are also important. Moose and caribou are harvested opportunistically and cannot be relied upon to provide for the household each year. Salmon are and have been dependable resources for these communities. They provide residents with the ability to live their lives in these communities on their terms, they provide a sense of contentment knowing that they will have food to make it through the coming winter, and they will have the freedom to continue living a subsistence lifestyle in these rural coastal communities.

FREEDOM

The community of Chenega Bay was reestablished in 1984 to provide residents who were part of a diaspora a place to return to in Prince William Sound, following the 1964 earthquake that destroyed their community. The community was built with a modern road, street lights, and even trash service, a service I have rarely seen in communities I have visited over many years of working in rural Alaska.

Another modern feature of the community is a modern dock where a few small boats are moored. There is no road out of the community and plane service is intermittent due to the weather; Prince William Sound receives tremendous rainfall in the summer and snow in the winter. Residents of Chenega Bay look outward towards the water to provide opportunities to travel, fish, hunt, and gain access to remote cabins. Living on the water near abundant salmon, halibut, and rockfish resources provides the residents with resources a short boat trip from the community. As noted in Figure 1-3, salmon and nonsalmon fish make up over 70% of the harvest of wild resources for this fishery dependent community. "Fishing is cultural," said Dennis Zackar, who participates in subsistence fishing and has worked on seine boats in Prince William Sound. The community works together to run the subsistence drift gill net. Both he and his roommate Tom Sherman participate in the subsistence fishery and share the catch with everyone in the community. Salmon have become more relied upon recently as the size of halibut harvested locally has diminished; they said that halibut are smaller now and their average size has diminished from 200 pounds down to closer to 20 pounds per fish in recent years. Residents still put out skates, a long line with multiple hooks, anchored on sandy marine terrain where halibut congregate (Turek, et al. 2009). Residents also receive salmon from seiners who drop off fish for local residents. These aren't always relatives of residents, just friends that have been fishing nearby and share part of their commercial harvest. Kids also fish for salmon off the ferry dock and can catch salmon and other nonsalmon fish easily at this location. Having access to so many available fish resources at one's doorstep provides them with a sense of freedom, especially for those who have boats.

Both Dennis and Tom subsistence fish for salmon and everything else they can catch, including rockfish and halibut. Dennis fishes for halibut from his skiff sometimes, and he can get rockfish close to the community as well. In 2007, I participated in subsistence halibut and rockfish fishing in the community

of Chenega Bay (Turek, et al. 2009). Over the course of several days, I accompanied a local resident while we directed our harvest at halibut, and then on another day for rockfish. I found that the two efforts were distinct and there were different strategies and areas used to target the two species. Both efforts were conducted close to the community and the fish were abundant.

Both Dennis and Tom said that they believe that Chenega Bay is a fishing community; that it is dependent on fishing to maintain their subsistence lifestyle. Both plan on remaining in the community because of the lifestyle and the freedom living in Chenega Bay provides. They both said that the community is quiet, there is no one to bother them, Chenega Bay is peaceful and safe.

In Kokhanok, on the south shore of Iliamna Lake, Renee and Greg Zackar discussed how Kokhanok is a successful community as far as subsistence, but economically jobs are scarce. "A lot of people in the community rely on government assistance. The less the household makes, the more they rely on subsistence, the biggest subsistence users are the ones that do not have the money to go to Costco," said Renee/Greg. They continue to live in Kokhanok because of family and the opportunity to live a subsistence lifestyle. They are heavily dependent on the salmon fishery to ensure adequate food through the year and the fishery provides an opportunity for Renee and Greg to pass on skills to their children and to teach them to work together. Besides fishing Greg enjoys hunting and continues to live in the community because of the freedom living in a rural community among abundant resources provides. Because the salmon fishery is so abundant he can take the time to pursue other species that are not always so dependable to harvest including moose, caribou, and brown bears. They have thought about leaving the community because of the lack of good paying jobs, or jobs in general, but really do not want to leave because they value living a subsistence lifestyle. The community is a subsistence

community and a fishing community, they say. Residents of Kokhanok are dependent on the salmon fishery.

Just down the road from Renee and Greg is Charlene Roehl. Charlene moved to Kokhanok 19 years prior and raised her family in the community. She says that living in Kokhanok provides her with the opportunity to live a subsistence lifestyle, while being close to the economic opportunities of the commercial fishery. Kokhanok is part of Bristol Bay, six hours by boat down the Kvichak, and both the commercial and subsistence fishery are paramount for the viability of the community. The commercial fishery allows for residents to retain a sense of freedom to live in their community by earning an income in the summer that gets them through the winter, while subsistence fishing provides them with adequate food security. "If we did not have subsistence, we would not have as many people living here, we would probably decline if we did not have subsistence," Roehl said. She said that fishing for subsistence is important for her household to meet their needs for food; she tries to harvest and process around 1,000 salmon a year, which is then split across three related households. She thinks it is important to pass her subsistence lifestyle onto her grandchildren. She continues to live in Kokhanok because she likes the community and thinks it is a great community in which to raise children. "Everyone watches your kids for you," she relates; someone always has an eye on your children. The children are able to go anywhere in the community, and to explore the area surrounding the community with other children in a safe environment monitored by many adults. She said that Kokhanok is a fishing community, and will continue to be dependent on the subsistence fishery.

Leonard Allowan of Tyonek says the value of fish for his household is a combination of economic and cultural. Currently he is teaching his boys how to "put up fish" (process) for the winter. He believes that this saves his family a lot of money. He doesn't have to go to the store to buy food when they have fish.

However, he said that although harvesting salmon is important to provide food for the winter, fishing and other subsistence activities are important for cultural reasons. "Culture is number one" he said in terms of importance, and he wants his boys to be able to survive off the land when they are older. Salmon fishing is just one part of the annual cycle for his family and being out on the land provides them with a sense of freedom. In the fall, he hunts for moose while also harvesting spruce hens. In 2014, he planned to harvest beavers to eat, an activity that has diminished in recent years in many Athabaskan communities as elders who grew up eating beaver meat slowly pass on. The younger generations have not acquired the taste for this strong, oily-tasting meat. But he wants to teach his boys how to hunt beaver, as hunting beaver is part of their cultural tradition. He wants to make sure his boys are prepared. Leonard thinks that people will continue to live in Tyonek. His boys will, because they are learning to live off the land. He believes that fishing will continue to be a large part of life for the community. He continues to live in Tyonek because "it is the only life he knows; there are too many rules in Anchorage. You cannot hunt; you have to travel to go hunting." He can hunt in his backyard in Tyonek. He has thought about leaving, but does not want to. "It is the only life I know," he said.

The sentiment by Leonard is a common one. Residents continue to live in the community because it is their home, it is what they know. Others who have lived outside the community though relate that they could not imagine now living anywhere else. Angela Peter continues to live in Tyonek because "this is home, and this is the most beautiful place in the world to raise a family."

Art Standifer of Tyonek has subsistence fished all his life. "We did not call it subsistence fishing back then though, it was a way of life; something we did," he said. To him, the value of fishing is cultural and dietary. Fishing is part of his annual cycle and he has to have salmon each year to eat; something is missing if he does not fish. His fish camp at Robert's Creek has been in his family since the late 1940s.

His father, Robert Standifer Sr., established the camp so that the family could have a place to harvest salmon. He was taught to subsistence fish by his father and older brothers and grew up watching and learning how to prepare fish for the winter. The camp was part of this annual cycle for his family; one of the most important annual activities that brought the family together each year, and an important activity for youth.

The sense of freedom is not a unique concept to this study. In their study of Yup'ik and Dena'ina perceptions of subsistence in the Bristol Bay region, Boraas and Knott noted that a "wealthy person "is a someone with "food in the freezer, a large extended family, and the freedom to pursue a subsistence way of life in the manner of their ancestors" (Boraas and Knott 2013:88). Being able to fill one's own cache or freezer with your own harvest on traditional lands and waters each year with family provides a sense of freedom and self-determination.

Family and Youth

It is difficult to separate out the various reasons given by residents of these three communities as to why they continue to live in their communities; culture, home, subsistence, and family are all interconnected. Conversely, residents were also asked reasons that might influence their decision to leave the community. Besides economics, most reasons relate to family including opportunities for children to get a better education, they themselves are getting older or require more health care and want to move closer to family in urban communities, or simply the desire to be closer to family (Figure 5-2). But for many, family continues to be an important aspect of remaining in their communities. In many urban communities in Alaska residents have resided in these communities for only one or two generations. Often there is little to no extended family nearby as people moved to these communities for jobs or

other opportunities. But in rural communities, there are large extended family kin groups. For example, in Nondalton near Kokhanok Fall, Holen, and others found up to four generations of people, most of which were residents of the community, working together at fish camps (Fall 2010; Holen 2009). Camps nearby one another had kinship links to other camps. So it is with Kokhanok. Camps are close together and residents fish in close proximity to one another (Figure 4-6).

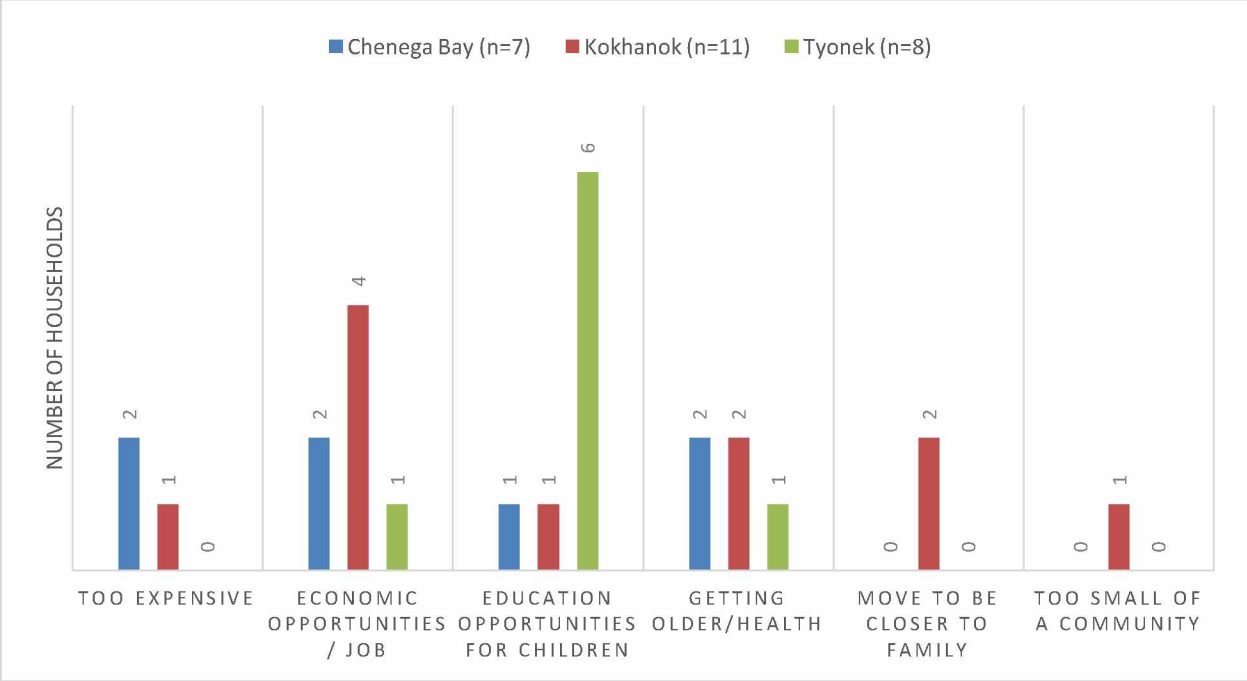

Figure 5-2. Reasons given why residents would leave their community

In Kokhanok, Greg Zackar has been subsistence fishing all his life. He watched his mother fish year-round. His wife Renee grew up with subsistence fishing as well. Renee grew up in neighboring Igiugig, another Yup'ik community close by on Iliamna Lake and there are strong kinship ties between the two communities. Renee said that there was a group of five ladies in Igiugig that helped teach her everything she needed to know for subsistence fishing. Both Greg and Renee agree that subsistence

fishing is imperative for their household. "Without it, we would not be able to live here, we would not have enough food to feed our family," Greg/Renee said. As noted previously, they harvest anywhere from 500-1,000 salmon every year to feed themselves, their five children, and a mother in-law that lives with them.[6] Renee says that subsistence fishing is important for family bonding, and the value of working hard to provide for yourself.

Although Kokhanok is part of Bristol Bay it is a considerable distance from the commercial fishery and therefore fish harvested in the commercial fishery are not retained for home use. This means that residents have to harvest enough salmon to meet the needs of all household members, even those that that may be away commercial fishing in the summer. Subsistence fishing takes place at the same time as commercial fishing. Often family members will fish for subsistence harvesting enough to meet the needs of family members who are busy commercial fishing. Charlene Roehl's children commercial fish during the summer so she works hard to put away enough salmon to meet the needs of the larger extended family of three households; she harvests around 1,000 fish a summer with the help of those members who are not out commercial fishing. Edwin Zackar who lives nearby and is part of the younger generation, learned to subsistence fish from his grandmother and mother. He started fishing when he was seven and has been fishing annually ever since. Currently his household includes just himself and his sister. "Fishing is very helpful, sometimes we cannot get a lot of groceries because they are too expensive," Zackar said. He owns a net that he bought second hand from his cousin. He does not have a

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[6] Residents in this region consider their harvest goals of salmon in terms of number of fish. Sockeye salmon in this region are fairly consistent in size and the goals are based on number of fish they are able to process, not the number of pounds. This differs in other regions such as Southeast Alaska. During interviews I conducted in Hoonah in 2013 for example, I learned that the size of Chinook salmon are taken into consideration when setting harvest goals as they are large salmon, often not as consistent in size, and fishers must account for their ability to store the meat from such large fish, instead of how many they can process.

boat, but other family members help. He works with other households to put up around 600 fish each year, which they then share. He thinks that subsistence fishing is good for the younger generation to learn how to fish. However, he does not see as many young people at the beach fishing as there had been when he was younger.

In Tyonek, fish camps are more spread out than they are in Kokhanok (Figure 4-8). Angela Peter of Tyonek was taught to subsistence fish by her grandfather and her dad. Typically, at her fish camp, it is just herself and her husband that fish, but sometimes a niece or a nephew come to help. They own their own net and boat. She believes that subsistence fishing is important for other reasons beyond just for food. She says it is about social interactions; it creates a sense of comradery. "I think it (subsistence fishing) brings people together," she said.

John Standifer fishes for the early Chinook salmon run for his household before he begins fishing for sockeye in the commercial fishery. Chinook salmon is so rich, he said and he grew up fishing for this salmon, this specific fishery, "it is part of life," he said. John was taught by his family how to fish. "You just grow up with it, you grow up around it," he said. Currently he fishes with four other households at his fish camp. John relates that fishing for subsistence is important to meet his household food needs, but it is more than that. Subsistence fishing is a job and a tradition, and it is important work to him.

Politics of Fishing and Place

Researchers working in coastal communities in Alaska have shown how local residents get involved in fisheries politics in order to benefit their family and community (Dombrowski 2007; Langdon 1989; Reedy-Maschner 2007). Politics affect both subsistence and commercial fisheries so both types of fishing will be covered in this section. Residents who were interviewed did not place importance on local-level

politics' ability to affect fishing opportunities. This project sought to understand if residents participated in political processes at the community, regional, or local level, then there might be benefits to their access and continuity in either subsistence or commercial fisheries. It also sought to understand how politics was articulated in each community, or if it was not as important as other issues.

To get a better understanding of local involvement in politics during the survey respondents were asked whether a member of their household participated in a local advisory council, a commercial fishing organization, or as a board member on a local or regional Alaska Native organization. As shown in Figure 5-3, a little more than 5% of households have had a member that participated in a local fish and game advisory council such as those organized by the Alaska Department of Fish and Game or the Federal Subsistence Program. In Tyonek, this is higher as Tyonek at one time had a Fish and Game Advisory Council. In Chenega Bay, 25% of households had a member who at one time was part of a fishing organization such as Cordova District Fishermen United or the United Fishermen of Alaska. In Prince William Sound, there are also organizations that represent the different gear types who fish in the commercial fishery: the seine fleet, the drift fleet, and the small set net fishery. This percentage was smaller in Kokhanok and Tyonek. The Tyonek fishery is a small commercial fishery in the Northern District of Cook Inlet where there is a large drift gill net fleet out of Kenai and Kasilof, as well as a set net fishery on the east side of Cook Inlet. Each of these fisheries has an organization that represents their interests to the Board of Fisheries. In addition, as the Kenai River is a sport fishing destination for people from all over the world, sport fishing guides on the Kenai have their own organization that represents their interests and send representatives to every Board of Fisheries meeting regardless of topic or area being discussed. For the most part, Tyonek fishers work together as a small group to find markets for their fish as well as organize tenders to come pick up the harvest, but they rarely participate

in decision making venues such as the Alaska Board of Fisheries. In Figure 5-3 board member refers to a member of a regional or village native organization or council. There was no reported current or past participation by Chenega Bay residents who responded to the survey in Alaska Native organizations, while Kokhanok and Tyonek both had household members who were part of their local village or tribal council, or larger regional organization.

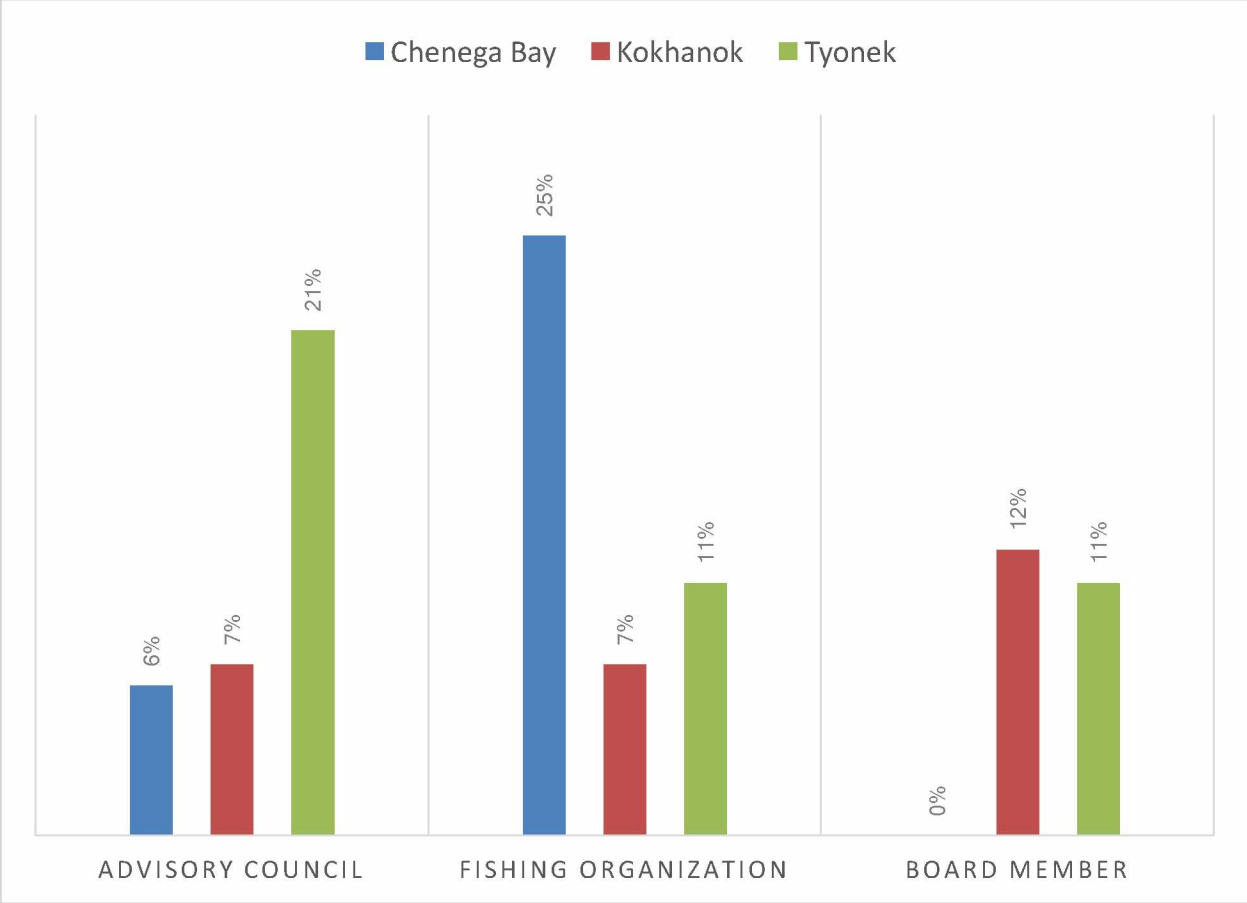

Figure 5-3. Percentage of households whose members have participated in a political process

Because of the sensitive nature of local-level politics, no names will be used in this section to identify respondents. Opinions varied among respondents in how useful participating in these organizations is

for residents. Some respondents related that they did not think their organization was very effective, while others responded that their organization to be very effective and because of this chose to participate. Only a select few Chenega Bay respondents have been involved with any councils or boards, nor have they worked for the tribal council. Respondents note that the local Chenega Bay IRA Council is effective and does a good job managing the community. They related that the IRA Council ensures that residents get their subsistence fishing permits so that everyone is legally fishing. They find it helpful for subsistence, but not for commercial. They don't think anyone in the community could afford to get back into commercial fishing and there has not been any effort as of yet to for the Chenega Corporation to assist residents in financing fishing licenses and boats, although there has been some discussion of this. One respondent has worked as a tribal administrator in the community, but has not been on a local advisory council. He came from Tatitlek, which is one of the communities where families from the original village of Chenega moved following the 1964 earthquake. He was on the Board of Directors for Tatitlek Corporation, and has dealt with State and Federal regulatory agencies.

In Kokhanok, one respondent was on the board of the Bristol Bay Native Association that represents Bristol Bay communities. He was the also the Kokhanok Tribal Council president at one time and a regular council member. Promoting the subsistence fishery is not a priority of the village council, but there has never been a problem with subsistence fishing as there are no limits and the run has consistently been abundant. The council mostly works in other areas and needs of the community. In addition, the Bristol Bay Native Association has an environmental department that represents the needs of area communities if necessary. The local Fish and Game advisory council (AC), Iliamna Lake AC, seemed to be more effective in this area. Another respondent was on the village council for less than a year and said that the local advisory council is more effective in representing subsistence interests and

does a good job. Another respondent was a member of the Iliamna Lake AC. He thinks working with advisory councils is an effective way to change regulations, but not as effective as he would like. He has held positions on the local tribal government.

Respondents have differing opinions regarding the effectiveness of the tribal council in Kokhanok. One did not think that local tribal councils, regardless of the community, are effective when it comes to issues that affect their subsistence fishery and other subsistence issues. Another thinks that local tribal councils in the area are effective in ensuring that residents maintain their subsistence rights, even if it just means they ensure everyone gets their paperwork filled out and returned to ADF&G. Often residents have a hard time filling out required paperwork and the tribal council assists with this. The same is true in Tyonek as well, the Native Village of Tyonek (NVT) assists with distributing subsistence fishing permits and helps residents navigate the complicated hunting paperwork for the local Tier II moose hunt.

As noted above, Tyonek has a Fish and Game advisory council, the Tyonek AC, which also includes residents of neighboring Beluga and Shirleyville; however, it has not been active in recent years. One respondent was on the Tyonek AC for many years and does not see it as very effective however, "we were able to throw suggestions out there, but it did not seem like it affected anything in the fisheries." Everyone in his family has been involved in some sort of council or tribal leadership role. Another resident noted that the AC was effective, though it needed to incorporate the community's position, not just the position of those on the AC. She says the weakness of the AC is that not enough participants have enough education on how ADF&G works with regulations and proposals. She thinks that there needs to be more regular meetings with a dedicated group. Having staffed Board of Fisheries and Game meetings for several years, it was rare that a resident of the community or AC would attend the board

meeting when contentious issues that would affect subsistence opportunity for Tyonek residents were discussed. It was only the knowledge gained during fieldwork that would allow me to articulate the importance of subsistence fishing and hunting opportunities to the Boards.

At times a Tyonek AC member did participate in the Board of Fisheries. One respondent did attend a Board of Fisheries meeting to testify and ensure the continuity of the commercial fishery. Others in the community are unsure how effective the AC is for representing local needs. One respondent summarized the common sentiment by saying that the issue is that not enough community members are active enough in the process to make it effective. He said few people in the community are active. He only personally knows one person who participates in the process.

Another respondent said the compounding problem is that community members are not well informed about regulations or the Board of Fisheries process and how to change regulations, which was also commonly heard. Others have chosen to take an economic instead of political approach to ensuring the future of the fishery in Tyonek. Besides NVT, the Tyonek Native Corporation (TNC), staffed by former and current members of the community, is also active in the community.

As noted earlier, two fish passage projects are underway or in process in the community. These projects are led by the Tyonek Tribal Conservation District (TTCD) with partial funding from the TNC. The first, which was completed in 2014, was to restore 7.5 miles of habitat on Tyonek Creek. This involved removing impediments to fish passage. The next project is to restore 8.5 miles of habitat on Robert's Creek. The TNC and TTCD are also looking at fish pens in Second Lake or other lakes to restore viable salmon populations. The fishers would then catch fish and sell them back to TNC to recoup some of the cost of the project. The concern though is that there are too many northern pike (*Esox Lucius*) in the

lakes now and this could disrupt the rearing of juveniles in the lake. The TNC and TTCD are working to fund a derby to harvest northern pike in the lakes.

Other efforts include providing the means for commercial fishers to get their fish to market. In 2014, the NVT arranged for Copper River Seafoods to provide a tender. The cost of shipping the fish was built into the price paid and worked out better for fishers than flying the fish themselves to Anchorage. The tender came five times but was not consistent, was undersized, and would only come if fishers in neighboring Beluga requested the tender. In the end, it was undersized and sank as it was not built for the tides and weather encountered in Cook Inlet. A new effort is for TNC to build a fish processing plant in Tyonek that could produce a value-added product, which would make more economic sense for shipping fish by air. The discussion of this plant will be covered in the next chapter on economy.

Conclusion: Place and Identity

During the course of interviews for this project, residents expressed how important fishing is in their own community for their families. Although each community is unique culturally, there is a common sentiment as to the value of fishing as part of the subsistence way of life, a way of life embedded in their cultural identity. A common theme throughout the interviews is that fishing provides a sense of belonging to a place and a feeling of identity. There is a certain kinship to salmon, a species intertwined in the lives of these coastal people.

Residents voiced that fishing as part of their subsistence way of life provides them a sense of home or place, a place to feel a strong connection to their family, culture, and a sense of freedom. Providing youth fishing opportunities where children could grow, learn to work with others, and learn the value of working alongside family, was a common sentiment. Fishing in many ways is the entry for youth into

subsistence activities, as well as for new residents of the community. In Kokhanok, Edwin Zackar said that fishing will continue to be a big part of the community, "it has been going on forever, before I was born." He said a lot of younger kids leave for college, and he hopes that they will come back. But for those that remain, everyone is involved in fishing. Even new residents like teachers and public safety officers participate in fishing alongside families that have lived in Kokhanok for generations. Roy Andrew of Kokhanok believes that it is important to continue to subsistence fish for more than just food, participating in fishing is an activity that "is cultural and gives us a sense of identity."

Being able to participate in fishing alongside family in harvesting activities in a landscape where there is a deep-felt sense of connection was also a common sentiment. Several residents noted how they were born at fish camp and have been fishing at these locations as long as they could remember. There are ties to the past that are embodied in subsistence fisheries, and in the present, subsistence fishing provides a sense of freedom and peace that makes residents want to continue living in their communities. Harriet Kaufman thinks Tyonek will continue as a viable community and that fishing will always be a part of that community. A "baby's first food is fish," she said. "As long as it is available (fishing), they will be doing it." She lives in Tyonek because "it is home," she said. She was born at her fish camp. She likes to go to fish camp and do all the things she was taught growing up by her parents and elders. There has not been a lot of changes in Tyonek and she likes that. When she was younger she thought that maybe she wanted to leave, just wanted more to do. But everything she needs, an opportunity to fish, hunt, get out on the land, is available in her hometown of Tyonek. "Tyonek is a fishing community," she said. Art, Harriet's brother, provided a similar sentiment. He says that Tyonek will exist forever and fishing will always be a part of the community. He continues to live in Tyonek

because, "I was born and raised here, this is my home." He said, "Before my time it's been a fishing community and it will remain a fishing community."

It was somewhat surprising to find that there was little participation in local-level politics related to fisheries by many of the respondents in the study communities. Respondents noted that the focus of village councils were focused on other topics, and they left local advisory councils to work on fish and game issues. Several respondents did participate in these councils. Kokhanok has abundant salmon resources and there has not been a need to organize around this issue. Each of the village councils participates in the process by ensuring that permits are filled out and returned to ADF&G. The Tyonek Native Corporations stake in the fishery has been to work towards rehabilitating salmon spawning and rearing areas. They are also investigating economic ventures to provide for the future of the fishery. The economic aspect of the salmon fishery will be the topic of the next chapter.

Chapter 6 – Economy

Commercial Fishery

Commercial fishing is important to the economy of all three of the core study communities. In 2010, the commercial fishery in Alaska harvested over 78 million salmon in Prince William Sound where Chenega Bay is located, over 4 million in Cook Inlet where Tyonek is located, and over 31 million in Bristol Bay, where Kokhanok is located (Figure 6-1). Both Prince William Sound and Cook Inlet have hatchery program to enhance commercial fishing, and Bristol Bay has abundant genetically diverse stocks of salmon (ADF&G 2017; Schindler, et al. 2010:609). However, local participation in the fishery doesn't directly correspond with the high regional salmon harvest as shown in Figure 6-2. Residents were asked if a member of their household participated in commercial fishing during surveys. In the results of this census survey in the three communities, whereas in Kokhanok, 44% of households had at least one member who participated in the commercial fishery, in Chenega Bay participation has fallen in recent years, and only 6% of households had a member participating in the commercial fishery. At the same time, during key respondent interviews, respondents noted that few residents of Kokhanok still have fishing permits, and most residents who still participate in commercial fishing now work as crew on boats or at commercial fishing set net sites, although they or their families once owned boats and permits in the past. In 2013, there were 12 active permit holders in Kokhanok and the total estimated gross earned by those commercial fishery permit holders was $172,417 (Figure 6-3) (CFEC 2015b). Tyonek was somewhere between with 21% of households reporting at least one member of the family involved in commercial fishing (Figure 6-2).

As shown earlier in Figure 4-1, when asked if commercial fishing was not important, somewhat important, or very important for the local economy, most respondents in all three communities related that fishing is very important for the local economy. Although participation may have fallen, residents' attitude about the value of fishing to the economy was high. Respondents related how their families had fished for generations, and even if family members were no longer fishing they still felt that it is important for the community and the region. In Tyonek, 21% of households had at least one member who participated in commercial fishing during the study year. In 2013, there were four active permit holders who fished in Tyonek, although there are a total of 17 permits available in the community. The total gross earnings in the community in 2013 by those four permit holders was $69,000 (Figure 6-3) (CFEC 2015b). There is no reported data for Chenega Bay from the Commercial Fisheries Entry Commission (CFEC 2015b).

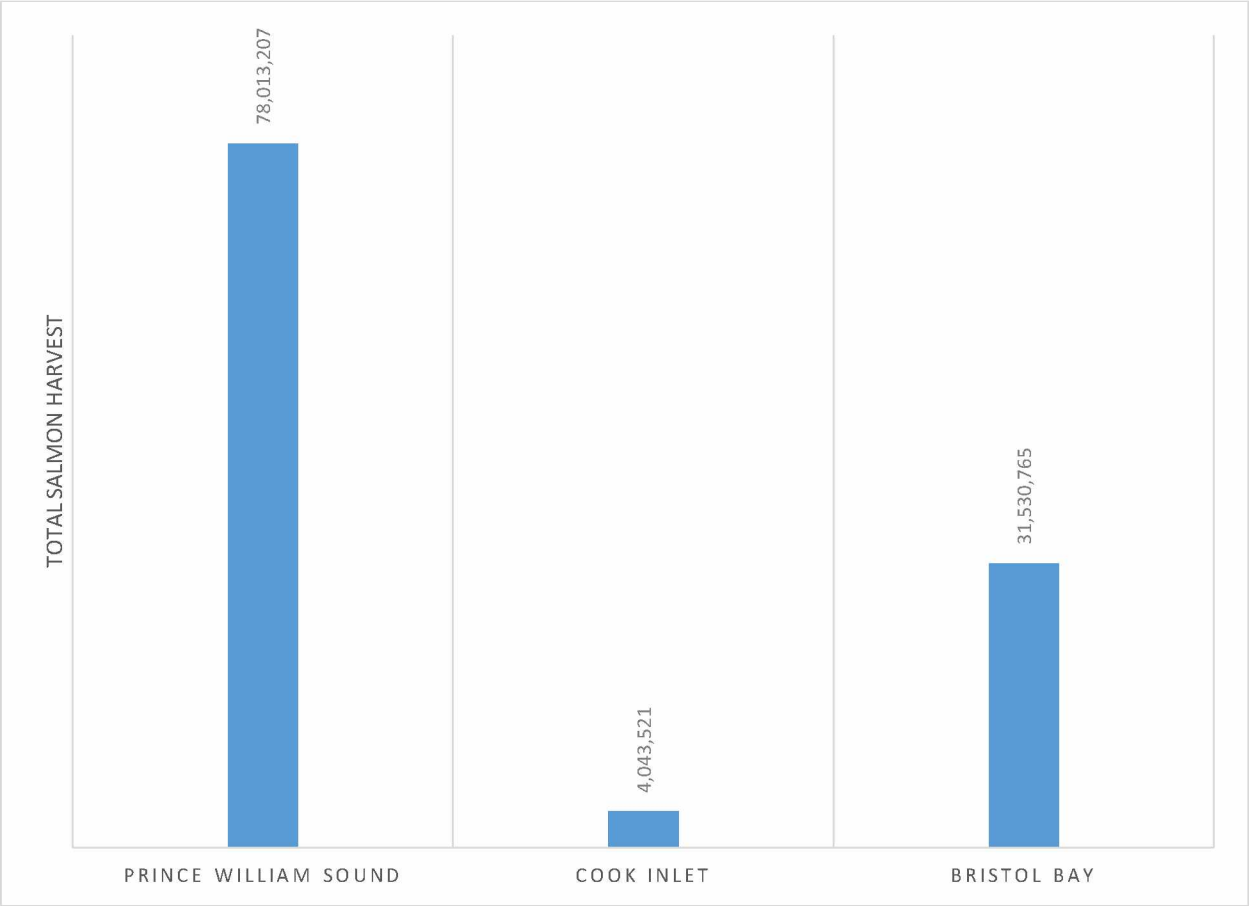

Figure 6-1. Commercial harvest of salmon by area, 2010

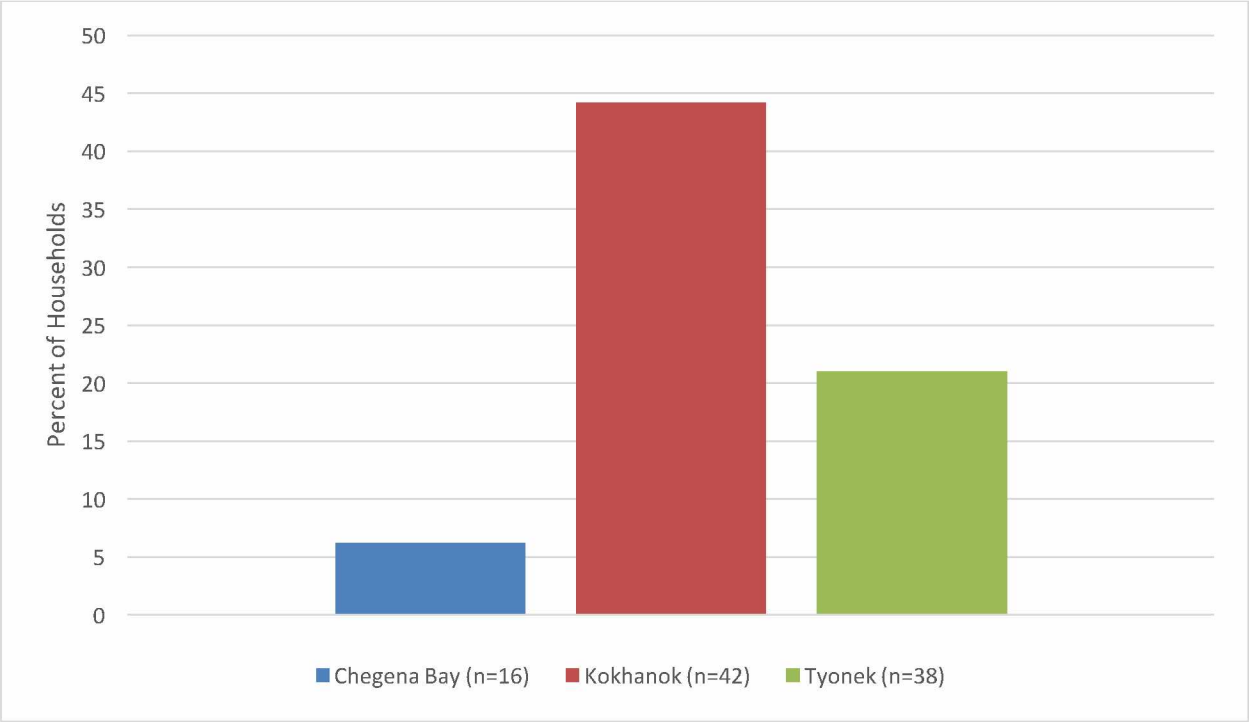

Figure 6-2. Commercial fishing participation, 2011

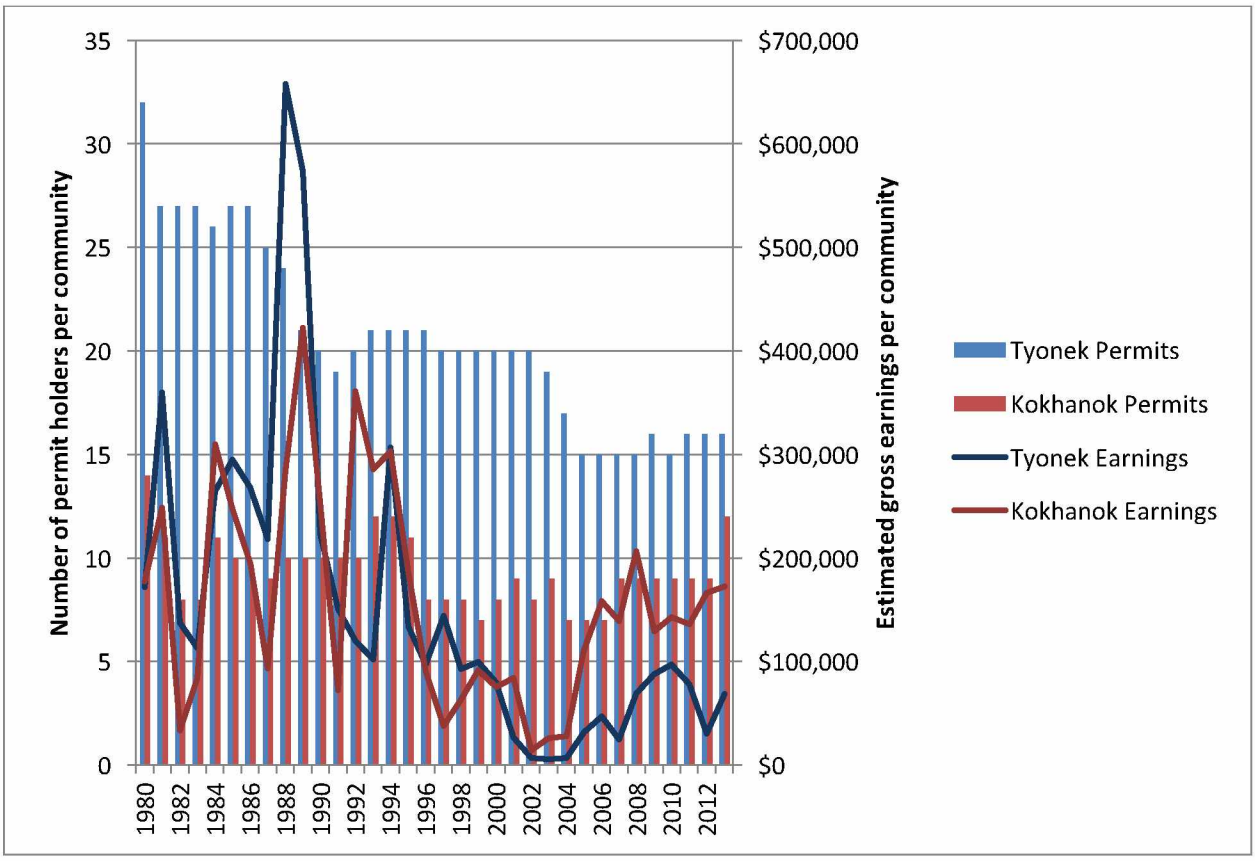

Figure 6-3. Number of State of Alaska fishing permits and total earnings by community, 1980-2013

These summary statistics for the study communities provide an overview of the current commercial fishery economic climate in these communities; however, they don't tell the story of the impact of a gradual decline in participation in the fishery over the past few years. Following is a discussion by local residents as to the history, current situation, and importance of the commercial fishery to their communities. This is followed by a discussion of the mixed subsistence and commercial economy. Both are important for these fishing dependent communities and continuity of commercial fishing as a way of life in these communities will rely on the younger generation to take over fishing activities. According to one resident of Tyonek, Harriet Kaufman, there is interest by the younger generation in participating in

the commercial fishery. However, to her it is not economics that is the driver of the younger generation showing an interest in the vocation of their parents and grandparents, it's a way of life that is being handed down to them by their parents, it's a way of life that "is in their blood."

TYONEK

Art Standifer of Tyonek commercial fished by set net on the beaches of Tyonek for many years and began when he was a child; he was 9 when he started as a deckhand, and he has been fishing off and on ever since. His family would harvest all five Pacific salmon species in the fishery to be transported to the processing facilities in Anchorage or Kenai by tender. What is changed is that there are no longer tenders traveling to Tyonek to pick up salmon and they must fly their harvest into Anchorage adding additional overhead to the cost of fishing. As costs increased and tenders stopped coming to Tyonek over time there has been a decrease in the number of people participating in the commercial fishery. Back when he was young in the early 1970s, there would be 30-40 commercial set nets strung out along the beach with boats and crew actively picking the salmon out of the nets during the incoming tides. Today there are few nets and only two commercial boats still operating in the community. He learned to commercial fish from his older brother Robert. When Art was single and without a family he could live off commercial fishing alone, but when he started having children he had to get a "regular job." He thinks that today with the cost of fuel and the price of just running a boat someone would not be able to survive on commercial fishing alone. When he was fishing, his fish went to Anchorage and Kenai. He has not fished in the last few years because he cannot afford the high overhead; he cannot afford the fuel, the price of exporting the fish via plane, and paying deck hands. He says that the actual return would not be enough to cover all these expenses. The economics of the fishery are not the only reason for the reduction of local effort in the commercial fishery. There is also a reduction in the number of fish

harvested as stocks have declined in upper Cook Inlet, especially stocks of Chinook salmon that net a higher price per pound for these larger fish. Art said he used to enjoy commercial fishing and misses fishing. Commercial fishing gave him confidence and helped him grow into himself. Although he has not fished in several years, he would never sell his permit; he wants to pass it along to his children. It's a way of life that he wants to pass on to his children.

Leonard Allowan, another Tyonek resident, consistently says that people do not commercial fish anymore because of the low price paid for fish, the high cost of fishing, and the lack of abundance of salmon. "Sometimes you can be out there and you can be fishing, and you will be spending more of your money on fuel than the amount of fish you are getting. Plus, there are no buyers, nobody wants to go out and go fishing anymore. That is a change, there used to be boats that would come over here to buy, now most of the times these guys have to take their fish out by plane."

Angela Peter has commercial fished for the past four years near Tyonek. She targets Chinook when the fishery is open, sockeye, and silver salmon. She also has watched the decrease in the number of local residents participating in the commercial fishery. She commercial fishes in Beshka Bay, several miles south of Tyonek where in the past there were five or six other participants in the fishery operating; currently there are only two. "You just cannot make money, you are just buying gas to basically look [for fish], it's just been really hard, and then with no tender, we can get stuck with fish." Commercial fishing is not her only source of income. She explains that you cannot make enough money just commercial fishing anymore, because of the high cost of transporting fish outside the community. She does not like the fact they must fly out the fish due to a lack of a reliable tender. It does not make economic sense to her, costing the fisher 50 cents for every pound, including coolers and ice.

A summary of the harvest of salmon in the Tyonek Statistical Area of the Northern District of Cook Inlet shows an increase in harvest especially of sockeye and coho salmon in recent years with 2009 being the highest harvest of sockeye in recent years and 2013 showing the highest harvest of coho in recent years (Figure 6-4). Yet Tyonek residents relate that their opening times are being cut in the commercial fishery and the higher overhead means they must catch more fish to still make less. In 2013 only 4 of 16 permit holders in Tyonek fished (CFEC 2015b). This comment may be attributed to the reduction in opening times for Chinook salmon, which have been less frequent in recent years due to lower abundance (Shields and Dupuis 2015).

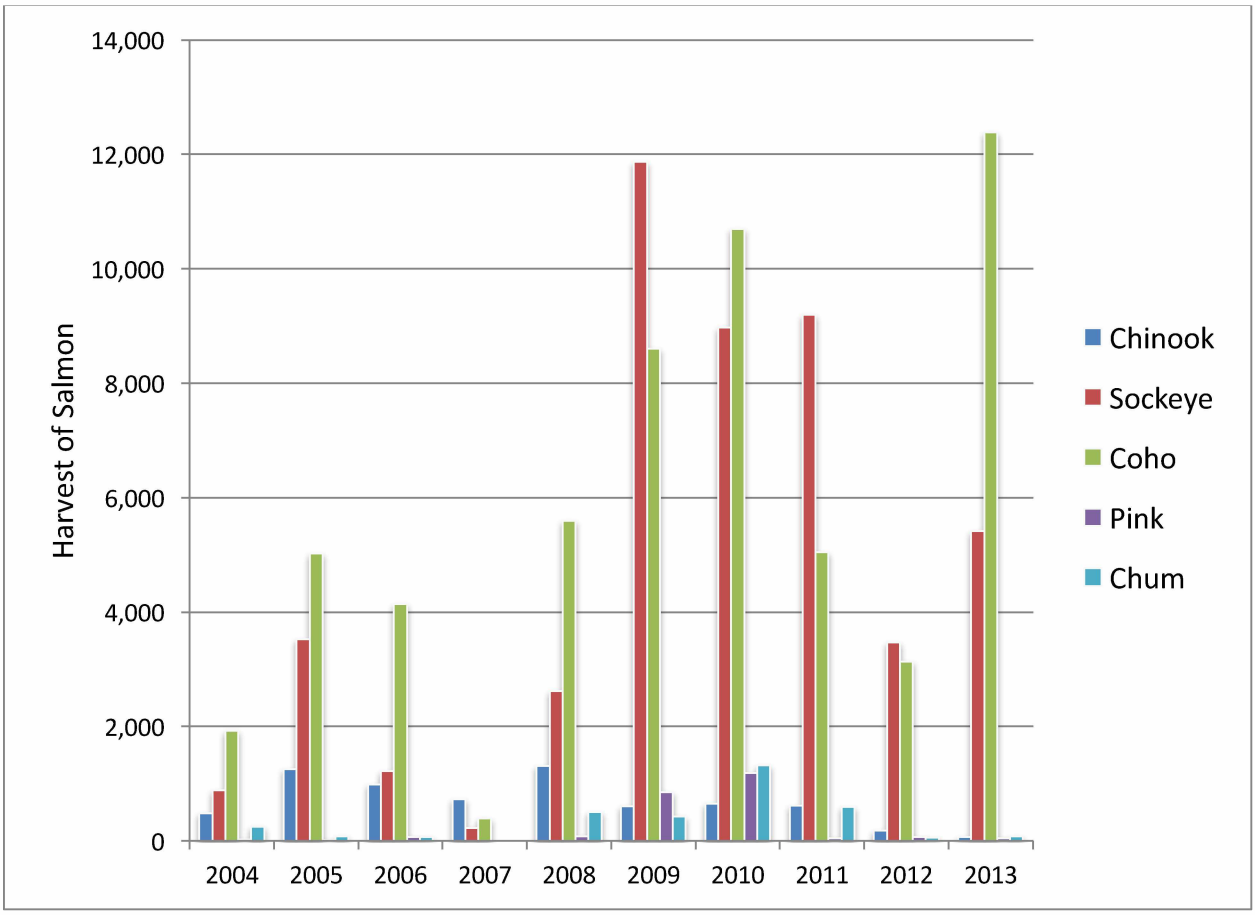

Figure 6-4. Harvest of salmon in Tyonek Statistical Area of the Northern District of Cook, 2004-2013

John Standifer, one of the main fishers in the community, has also seen a decline of the number of people participating in commercial fishing in Tyonek. He thinks there are a lot of reasons, the largest being the cost of fuel and the lack of a tender. His grandchildren commercial fish with him, the youngest is six and helps gut and clean the fish. Besides Native Corporation dividends, commercial fishing is his only source of income. He fishes all summer, fishing every opening he can to catch as many fish as possible to ensure he covers his costs. He flies his fish out of the community; the fish go to a fish processor in Anchorage that then sells them locally in Anchorage and beyond. The processor can pay higher prices as the salmon go straight to restaurants and are sold in the local market, adding a higher value to the salmon. It is important for John to have his grandchildren join him in the fishery. It has been his way of life and one he wants to pass on to his family. He has no plans to stop fishing anytime soon but when he is ready to retire he would never sell his permit. He received his permit from his family, and he has every intention of handing the permit down to continue the family legacy.

KOKHANOK

Greg Zackar of Kokhanok has commercial fished for thirty years and continues to fish currently. Sometimes he runs a set net on the beach, but most of the time he fishes on a drift net boat. Often, he works as a crew on someone else's boat but will occasionally lease a drift permit from his cousin. He fishes in Bristol Bay in the Egegik and Naknek fishing districts. He tries to fish every summer. Greg thinks that if he had his own drift permit he would be able to make a living solely on commercial fishing. He has thought about getting a permit, but entry into the commercial fishery is prohibitively expensive for him.

Renee, Greg's spouse, commercial fished with her mother and stepfather as an unpaid crewmember. They operated a commercial set net site in Big Creek in the Egegik District on the Alaska Peninsula. Renee said that in Kokhanok, and among communities in the area there has been some reduction in participation in the fishery but not as much as seen elsewhere. Greg has noticed that participation changes extend to not wanting to be burdened by high overhead. Instead he sees residents selling their permits and then joining as crewmembers on someone else's boat instead. Commercial fishing is still part of the way of life in Bristol Bay and people will continue to fish but must make accommodations for the high cost of the fishery today. However, with prices paid for salmon rising in the commercial fishery, some residents, especially the younger generation are trying to buy into the fishery. The 2012 season was the best he had in many years. He enjoys commercial fishing because it is an exciting job, but it is also a part of life that he has become accustomed to.

Charlene Roehl agreed with the observation that she has noticed several residents selling their permits and continuing to fish as crew. The older fishers who have been in the fishery since the advent of limited entry never went back after they passed on their permits to their children or sold them during the lean years, especially in the early 2000s when salmon prices paid in the Bristol Bay fishery were low. There are a few residents of the community that still have commercial boats, but most just have skiffs that they use in the set net fishery having sold out of the more lucrative drift gill net fishery. Charlene says that all her three children commercial fish. Her son has her permit; she told him never to sell it. Her daughter is going to get her own permit next season. Her youngest son fished as a crewmember in Egegik this past year. She does think that the same number of people still commercial fish as in the past, just not as permit owners often anymore. She says that there are lots of local advertisements for crewmembers.

Garry Nielsen who used to commercial fish related a similar sentiment that there are few permit holders in Kokhanok anymore. Today about 30-40 people from the community go down to Bristol Bay to fish but 90% are crew members on boats or assisting at set net sites. There are seven permit holders in the community (in 2012). He says that it's impossible to make a living off fishing anymore, back in the 1980s when prices were $2.50 a pound then yes, you could make a living, but not anymore. Today he said the average is to bring back around $9,000 from 5 weeks of work as a permit holder. It's not a living but a supplemental source of income. The overhead is high, the price paid for fish is low, and fishing openers are competitive.

CHENEGA BAY

As noted above, there are no permit holders in Chenega Bay (CFEC 2015b). Darrell Totemoff has been a crewmember on both seine and drift gill net boats in Prince William Sound. He started fishing in the Copper River District in the 1970s with his father and continued fishing into the 1980s. He says that today commercial fishing is more of a traditional activity of residents of Prince William Sound and most of the serious commercial fishers that used to live in Chenega Bay have moved to Cordova, Valdez, or Anchorage. Some come back for the summer while they are out fishing and will stop by the community and their family members will occasionally join them on their boats to fish for a few weeks. His brother currently has seine and drift gill net permits and lives in Cordova. Another brother who is gone now also fished and had both seine and drift gill net permits.

Dennis Zackar and Tom Sherman, who were interviewed together for this project, both commercial fished in the past. They both fish as crew on boats and have never owned permits. They both fished throughout Prince William Sound from the Copper River District near Cordova to the area right in front of the community. Tom worked as crew on a drift gill net boat and Dennis worked as crew on both a

seine and drift gill net boat. No one in the community has a permit they say; there are no commercial boats and no one really fishes anymore. But to them the issue isn't lack of abundance or low prices paid for fish as people in Kokhanok and Tyonek relate. It has to do more with the Exxon Valdez oil spill of 1989. "They got too rich from Exxon, they are getting sent a check every month. Fishing went downhill so bad after the spill, the fish were worth three cents a pound or something like that, it wasn't even worth fishing." People got out of the fishery during that period and found other work, never returning to the fishery. There was an entire generation that chose not to fish. Commercial fishing as a way of life was something that was missing in the community for many years and children did not grow up on commercial fishing boats with their parents, participating in a way of life.

In Chenega Bay, the interruption in the fishery disrupting a way of life came through the Exxon Valdez oil spill EVOS event in 1989. In both Kokhanok and Tyonek, the interruption in the fishery came from low years of participation due to low prices paid to commercial fishers. For example, in Kokhanok, residents noted that there were many years when some residents sold their fishing permits and boats and stopped traveling each year to Bristol Bay to fish commercially. As shown in Figure 6-5, in Bristol Bay, prices paid per pound for salmon began to decline in the early 2000s going from $1.22 per pound for sockeye salmon in 1999, to as low as $0.42 in 2001 (Jones, et al. 2013:95). Beginning around 2008, prices started to go up again and in 2013 processors were paying $1.53 per pound for sockeye in Bristol Bay (Elison, et al. 2015). According to residents, after a few years of losing money they stopped fishing, which meant some children did not grow up assisting parents in the fishery. Traditionally, children travel with their parents and participate as crew on boats learning how to fish. Children become enculturated into the commercial fishing lifestyle by participating alongside their parents as young people, just as they do when participating in subsistence fishing. When they are older, this new generation may take

over the boats and fishing permits from their parents, if social and economic conditions allow for such continuity in the fishery. Only in the past five years, as prices for salmon have continued to increase, are residents attempting to re-establish this way of life. Residents in Kokhanok and Tyonek especially said they want to continue to commercial fish. Commercial fishing is hard work but it is exciting, it is a vocation that allows one to work outside all day on the water, and if you are a permit holder, to be your own boss. It's a way of life that residents articulated they want to pass on to their children. It becomes difficult to separate out social reasons for participating in the fishery, passing on a way of life to one's children, learning the value of hard work that will serve youth into adulthood for example, with the economics of having a good paying job that allows one to continue that way of life. Before turning to a discussion of the intertwined reasons for commercial fishing in these fishery dependent communities, I want to briefly discuss the economic basis of the commercial fishery.

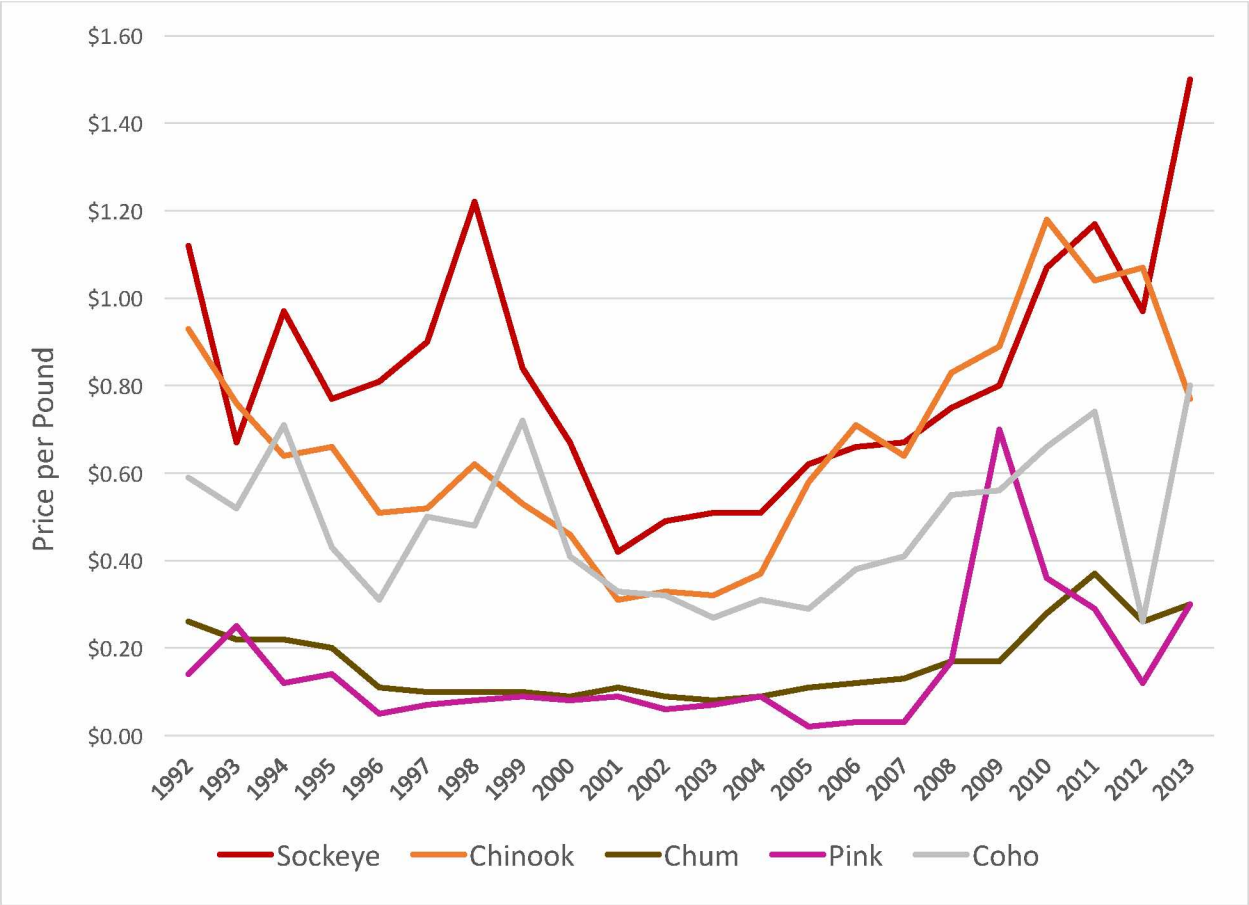

Figure 6-5. Average price paid in dollars per pound for salmon, by species, Bristol Bay, 1992-2013

Sources: Jones, et al. 2013; Elison, et al. 2015

Discussion of the Economic Value of Salmon Fishing in the Core Study Communities

While in many rural Alaskan coastal communities commercial fishing creates a robust economy, in the three study communities commercial fishing has contributed a decreasing number of jobs for community members. For example, in 1980 there were 14 active permit holders in Kokhanok, by the early 2000s, this had been reduced to about half this number (Figure 6-3). Only in 2013, the most recent year for which data is available, has this number of permits started to return to this level with 12 permit holders in the community of which 10 permits were fished (Figure 6-3) (CFEC 2015b). Figure 6-5 shows that beginning in 2010 prices paid per pound for salmon begin to increase, encouraging for Bristol Bay fishers. Low participation in the early 2000s are attributed to low earnings in the fishery as a result of low salmon prices paid (Figure 6-5). In 2002 for example, the estimated gross earnings for the community from the commercial fishery was $14,193, compared to an average over time (1980-2013) of $159,653. The community of Tyonek faced a similar situation in the early 2000s. In 2003 for example, the estimated gross earnings for the community were $5,899 compared to an average over time (1980-2013) of $152,618 (Figure 6-3) (CFEC 2015b). That year out of 20 permit holders only 4 chose to fish their permits. There are no statistics available for Chenega Bay as no permits are issued to a resident with a Chenega Bay address (CFEC 2015b).

Very few residents of all three communities stay in the community for jobs; they stay for other reasons that are important for quality of life such as family, culture, and the subsistence way of life (Figure 4-2). But jobs are important for community viability and fishing is often a vocation that is located close by, uses equipment that can also be used for subsistence fishing, and often involves working alongside family. Tyonek is close to major urban centers in Southcentral Alaska and efforts are underway to revitalize the sagging commercial fishery. Fresh fish from Tyonek is served in Anchorage restaurants

within a day or two of being harvested in Upper Cook Inlet. Efforts are underway by the Native Village of Tyonek (NVT), to open their own facility to provide fish processing jobs and to produce a value-added product that can be shipped out of the community to nearby urban areas such as Anchorage. TNC and NVT passed a resolution to create a joint venture to develop the fish processing plant in Tyonek. There have been several meetings in the community to get feedback from fishers on the project. Between 4-8 fishers have participated in the meetings and currently there are 17 active permit holders in Tyonek. The first step was a feasibility study conducted by Andrew Crow at the UAA Center for Economic Development. The feasibility study identified several products that could be made. The product that was seen as the most feasible is cold smoked salmon. All species harvested will be processed as different buyers want specific species, e.g. Chinook, sockeye, or coho. The feasibility study was funded by the Tyonek Tribal Conservation District (TTCD), an entity first created through the Natural Resources Conservation District initiative of the U.S. Department of Agriculture. The next step is to write a business plan. This will be funded by TNC. Betty Ross at the University of Alaska Fairbanks will write the business plan. The facility that is to be used will be the old wood chip processing plant and dock located about a mile south of the community. The facility will be renovated. The dock will be used as fish waste can be pumped down the dock and then deposited well out into the inlet so as not to interfere with ongoing subsistence and commercial fishing. TNC will own the facility and rent it to the NVT.

The Chenega Corporation, the Alaska Native Corporation that represents the community of Chenega Bay, is also working on a program to get more residents into the fishery by providing financing for community members to purchase boats and permits. As noted, few Chenega Bay residents continue to fish in Prince William Sound today, and the dock built in the community around 1984 is rarely used by

commercial fishing boats. There are no reported permit holders currently residing in Chenega Bay (CFEC 2015b).

As mentioned in the introduction it was a Board of Fisheries meeting in 2009 that provided me with questions I wanted to answer to better understand the intersection of the commercial and subsistence fisheries to promote resilience in coastal communities. Since attending Board of Fisheries meetings in the early 2000s, especially at meetings for Bristol Bay, during public testimony themes emerged from commercial fishers about improving fish quality and value. There was considerable discussion about making boats wider to allow for the ability to have onboard cooling systems (refrigerated seawater systems) to cool the fish down quickly and float them in water so that they arrive at the dock in good shape ready for filleting. Bristol Bay prices fell in the early 2000s as noted in Table 6-1. During this period "rural producers expressed a pervasive feeling of falling behind and, for some, a palpable fear of extinction" (Hebert 2015:39). Local fishers especially were having a hard time making a living in the fishery, with about a third during this period not making enough to cover expenses (CFEC 2002; Hebert 2015). Knapp notes that in 2003, average revenues for local residents of Bristol Bay were significantly lower than for residents of other areas of Alaska and other states (Knapp 2011: 660). In Dillingham for example, the regional center for Bristol Bay, many people have full time jobs which they would need to take time off from in the summer to fish. During this period when prices were low some local residents of the region chose not to participate as that meant losing money both from their full-time jobs and in the fishery (Apgar-Kurtz 2015:75). The product produced in Bristol Bay for over 100 years, canned salmon, was no longer desired. The future was in promoting a high-quality fish. Noting the reorientation of a fish processing center in Dillingham, "a new structure houses multiple fillet processing lines, sleek machinery, and high-tech blast freezers, signaling the industry's rapid reorientation to produce "quality"

salmon for more profitable market segments" (Hebert 2010 *In* Hebert 2015:42). Large processors like Peter Pan and Trident Seafoods, both with multiple processing facilities in Alaska, have all reoriented production to produce higher quality products (www.ppsf.com; www.tridentseafoods.com).

Improved prices for salmon also meant that permits became more valuable and difficult for local residents. "In general, an increase in the profitability of a fishery is likely to reduce the local permit share" (Knapp 2011: 662). Non-local residents may see higher fixed costs associated with fishing, but higher revenues will also mean higher profits relative to local residents (Knapp 2011:663). There are beneficial factors though for local-residents in the commercial fishery in general. Knapp notes two factors meaningful to this discussion. Local-residents have experience and knowledge which they use in competing with non-locals. The second is that there are synergies with other activities, including subsistence (Knapp 2011:663). Local residents have knowledge of the fishery which means they also have a greater interest in the fishery and the success of the fishery. Each permit in a local community can mean 2-3 additional jobs for crew. As noted above in Kokhanok residents are re-entering the fishery in Bristol Bay as crew. There are programs such as through the Bristol Bay Economic Development Corporation which provide discount loans and subsidies to residents to purchase permits. However, there are barriers to participation as young people especially do not have experience in commercial fishing and are reticent to take on large loans (Apgar-Kurtz 2015:74). Youth need to be provided with opportunities to gain experience and confidence. "Once a fishing permit is sold, families no longer have access to the fishery and fishing knowledge is lost in that family" (Apgar-Kurtz 2015:72). Additionally, more local programs need to be available for the community as a whole to participate in the salmon fishery. For example, in 2009 the Togiak Traditional Council partnered with Copper River Seafoods; an Alaska company, to open a fish processing plant in Togiak in Bristol Bay. Togiak has a high percentage of

locally-owned permits. The plant pays higher prices for fish, "challenging other processors to complete with them" (Apgar-Kurtz 2015:76). At Board of Fisheries meetings for Bristol Bay Silver Bay Seafoods, an Alaska company from Sitka, also discussed expanding into Bristol Bay.

These examples from Bristol Bay, Prince William Sound, and Tyonek show that locally owned processing facilities could encourage local residents to continue fishing and encourage the next generation. "The ties that connect people, ancestors, animals, and ecosystems in Bristol Bay are inextricably enmeshed with the region's identity as a place of salmon, just as they are materialized in the fish that work their way up its tributaries each summer" (Hebert 2015:41). This comment about Bristol Bay is also true of Prince William Sound and Cook Inlet. The salmon provide for both economic and subsistence opportunities for residents of coastal Alaska.

As one respondent noted to Hebert "I believe people who live on the coast of Alaska will always live on the coast of Alaska because we have our resources that brought our forefathers here and we're not gonna leave" (Hebert 2015:41). In summary, commercial fishing is no longer a large economic contributor to the vitality of Kokhanok, Chenega Bay, or Tyonek; however, it is still valued for its limited economic benefits, and residents hope that it will become more valuable in coming years as they seek to pass on this way of life to their children.

Boats, nets, and the income from commercial fishing provide inputs to the subsistence economy. Without subsistence fishing, respondents in Kokanok, Chenega Bay and Tyonek conveyed that they could not afford to live in their communities; more importantly they relayed that they would not want to live there. Subsistence fishing is a way of life and from an economic standpoint subsistence caught fish offset the high cost of flying in groceries. Groceries brought in by plane add between $.60 to $1 per pound to their cost, depending on the size of the food order. Subsistence practices ensure adequate

food security throughout the year, especially for those households that harvest anywhere from 300 to 1,000 salmon a year for themselves and to share with other households. However, economics was only one factor in why residents articulated that subsistence fishing is important for their way of life.

Comparative Communities

Although statistics of fishing as a percent of a resident's income were not collected for the three core study communities, these statistics were added to follow-up studies in other communities. As mentioned earlier, harvest assessments were included for communities in the Chignik Management Area on the south side of the Alaska Peninsula in the Gulf of Alaska within the Lake and Peninsula Borough. This includes the communities of Chignik Bay (pop. 96), Chignik Lake (pop. 70), Chignik Lagoon (pop. 72), and Perryville (pop. 101) (Figure 1-1) (ADLWD 2015). In 2013, Chignik Bay had 8 permit holders, Chignik Lake had 4, Chignik Lagoon 21, and Perryville 8 (CFEC 2015b). Over 40% of households in all four communities reported income from commercial fishing and in the community of Chignik Lagoon, 39% of households reported that 75% to 100% of their income came from commercial fishing, with 26% of Chignik Bay households, 25% of Chignik Lake households, and 12% of Perryville residents reporting the same (Figure 6-6). Significantly, Chignik Lagoon showed that 61% or more of their income comes from fishing. As noted in Chapter 4, these communities have high harvests of salmon for subsistence, demonstrating that they have a high dependency on both subsistence and commercial fishing.

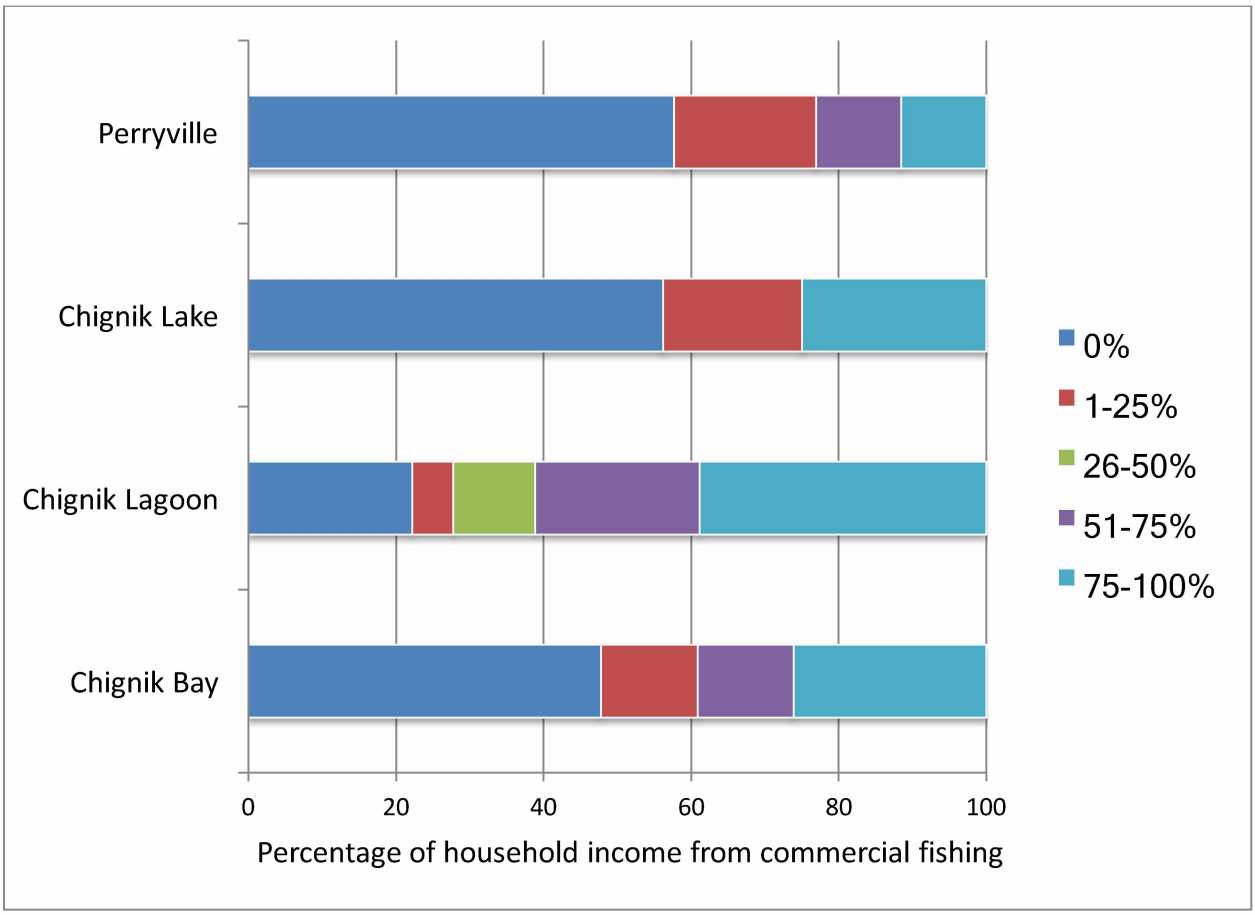

Figure 6-6. Percentage of household income from Commercial Fishing, Chignik area, 2011

Three communities were surveyed in Kodiak. As noted earlier, the goal was to compare the harvest, use, and participation in harvesting between a sample of salmon permit holders in Kodiak City (pop. 6,329), a sample of the rest of the community, or what we will call the general population, and then census samples in two smaller communities on the island to compare to Kodiak City. The smaller communities are Larsen Bay (pop. 71), which also has a thriving sport fishing industry as well as resident commercial fishers, and Old Harbor (pop. 213) which has a strong commercial fishing economy (Figure 1-1) (ADLWD 2015). In 2013, Kodiak City had 317 State of Alaska fishery permit holders, Larsen Bay 11,

and Old Harbor 17 (CFEC 2015b). Due to the sampling strategy of surveying a sample of subsistence salmon permit holders and a sample of the general population, categories were added that include those that do not commercial fish, or did not give a response to this question. Overall Old Harbor can be compared to Kodiak City in that a little under 20% of households reported that 75%-100% of their income comes from commercial fishing (Figure 6-7). Interestingly, not all Kodiak City residents who hold permits fish their permits every year. In 2013 for example, there were 317 permit holders in the community and only 221 were fished.

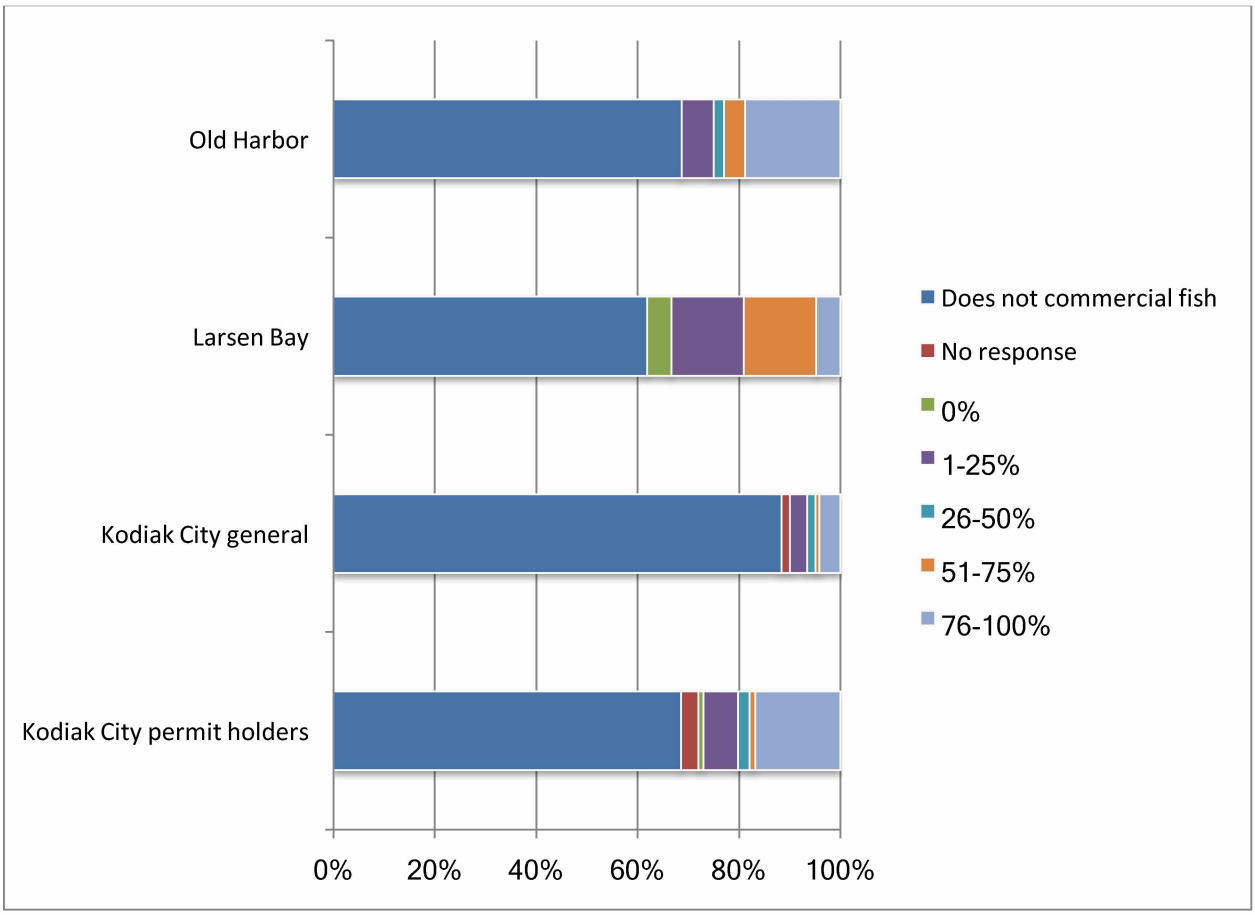

Figure 6-7. Percentage of household income from Commercial Fishing, Kodiak, 2012

In Southeast Alaska, the study included surveys conducted in 2013 in the communities of Angoon (pop. 416), Haines (pop. 1,805), Hoonah (pop. 787), Hydaburg (pop. 405), and Whale Pass (pop. 39) (Figure 1-1) (ADLWD 2015). As noted earlier, the goal of this project was to survey a diversity of communities throughout Southeast Alaska that represent different sizes, geographic areas spanning the farthest north community of Haines to the south end of Prince of Wales Island, as well as cultural backgrounds including predominantly Tlingit (Hoonah and Angoon), Haida (Hydaburg), and Euro-American communities (Haines and Whale Pass). Communities were also chosen that exhibit different involvements in commercial fishing. Haines for example has a large commercial fishing fleet, whereas Hydaburg and Hoonah have mixed commercial fishing economies, and Angoon and Whale Pass have become predominantly sport fishing destinations. Figure 6-8 shows income statistics for the communities of Hydaburg, Hoonah, and Haines. There was no commercial fishing income reported for Angoon or Whale Pass. In 2013, there were 12 permit holders in Angoon (only 1 reported fishing with no reported harvest), 85 in Haines, 82 in Hoonah, 15 in Hydaburg, and 1 in Whale Pass with no reported harvest (CFEC 2015b).

Of those that reported commercial fishing, Haines had the highest percentage of overall income from commercial fishing with 59% reporting that 50% or more of their income comes from commercial fishing, while 50% of Hydaburg commercial fishers reported the same. Hoonah also showed a high percentage of income from commercial fishing (Figure 6-8). While conducting salmon harvest assessment surveys in Hoonah in 2014, I spoke with several commercial fishers, especially young people who were just entering the commercial fishery. Hoonah has a high number of limited entry salmon fishing permits (82) for a small community of 1,805 people. Residents can take advantage of the salmon troll fishery, which targets Chinook in the winter and spring. The troll fishery is not capital intense and

provides a modest income for a much lower overhead than the drift gill net or seine fisheries. Several young people reported that they are entering the commercial fishery by obtaining troll permits. Troll fishing is seen as an entry level fishery. If a fisher does well in the troll fishing, they could use the proceeds and experience to then move up to the more lucrative gill net or seine fisheries.

During the 2013 survey in Southeast Alaska, respondents were also asked if they no longer fished in the commercial fishery, what were their reasons for getting out of the fishery. Figure 6-9 shows responses to this question. Residents of Angoon, which has a low participation in commercial fishing, reported that that economics was the main reason many had sold their permits. In Haines residents reported they had other jobs, that they just did it as a onetime activity, or other personal reasons. Hoonah showed similar responses and some residents noted that they did not have boats anymore to be able to participate. As noted previously, the expense of entry into the commercial fishery can be overcome in Hoonah where the more modest troll fishery is available. Small boats, even open skiffs, are often used in the troll fishery. Overall though personal reasons such as health, getting older, or retiring were common reasons in all four of the active or once-active communities.

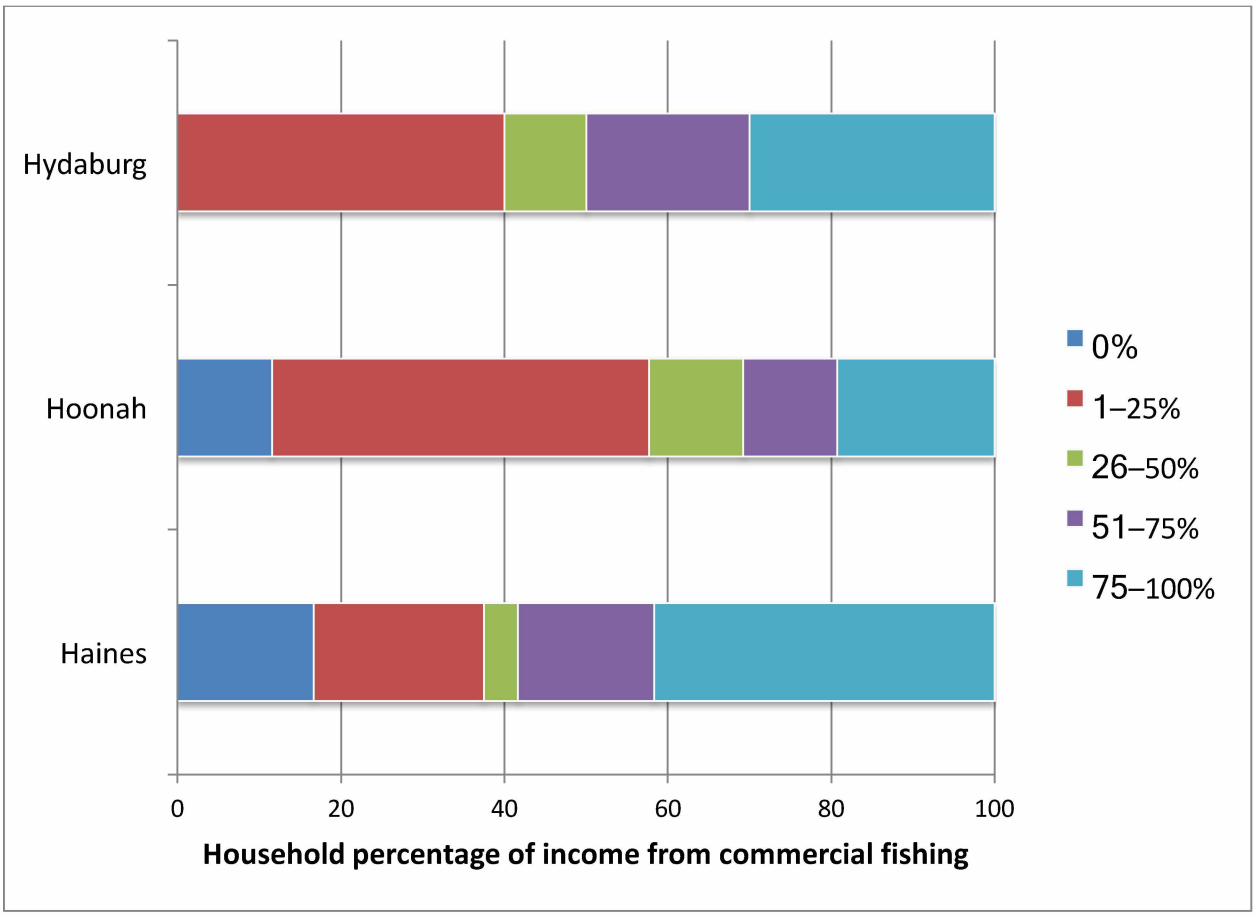

Figure 6-8. Percentage of household income from commercial fishing, Southeast Alaska, 2012

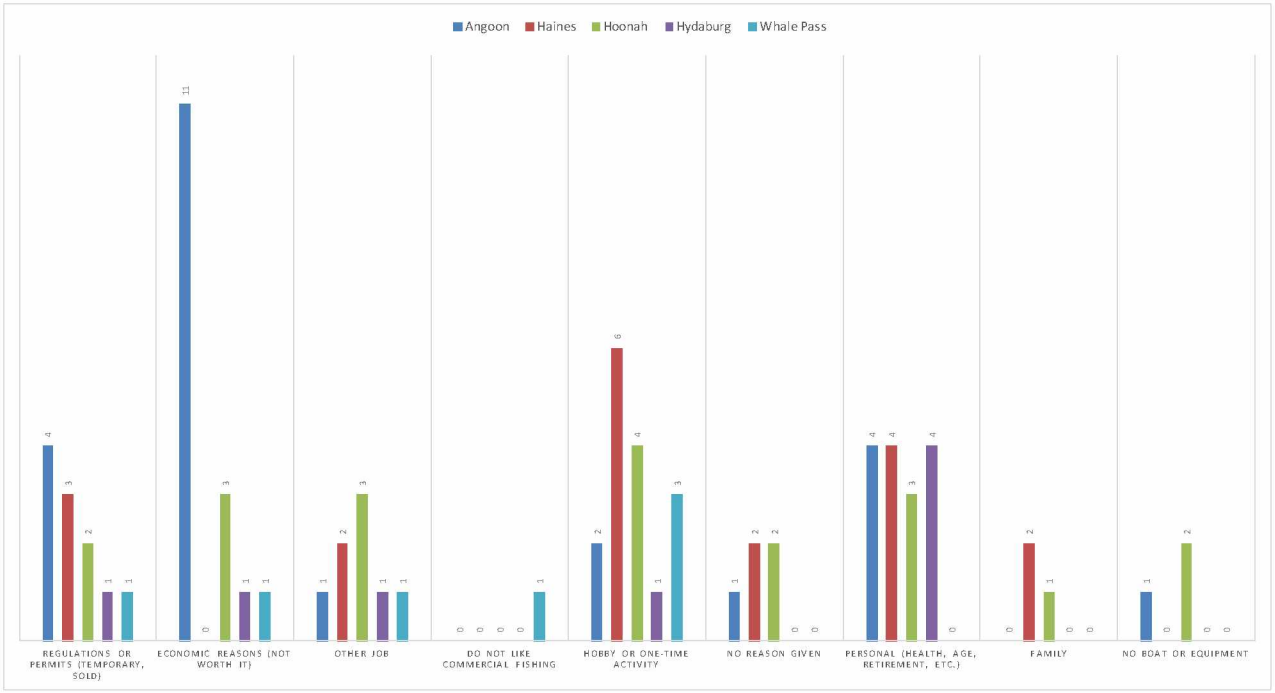

Figure 6-9. Reasons given as to why respondents no longer participate in commercial fishing, Southeast Alaska, 2012

Discussion: A Mixed Fishing Economy

In 2005, I spent several days on the beach near an old village site south of the community of Tyonek, locally called Old Tyonek, the village site that was occupied at the time of Russian contact. Today the old log cabins, log school and orphanage, and caches are gone, replaced by contemporary frame cabins built on pilings. Just north up the beach is the now abandoned dock and wood chip processing facility that NVT hopes to one day turn into a fish processing plant. The site is only about a mile down the beach from the community, a quick ride on an ATV, but during the fishing season, the cabins are occupied full-time as residents focus their efforts on fishing.

In Tyonek residents start thinking about fishing long before the subsistence season opens on May 15. Residents travel to the camps to open their cabins, clear brush, and clean up from winter storms. The tides in Cook Inlet are the second highest in the world and a winter storm as well as spring flooding are constant concerns for residents. Besides preparing camp, running lines for drift gill nets are set by anchoring them on the beach and extending them far out into the silt of Cook Inlet where the other end is anchored into the knee-deep silt. Every few hundred feet on the beach you come across running lines. Fishing begins in earnest on May 15 with a few residents prospecting to see if the salmon are running. Once a good number of fish are harvested, then every net on the beach is in the water. Chinook salmon are harvested in this first part of the season and almost the entire effort is focused on subsistence, with very few people commercial fishing. Residents will continue to subsistence fish until most of the Chinook salmon have come through in early June and then they will switch their effort to commercial fishing for sockeye and coho salmon continuing to commercial fish through July and August.

Back in 2005, I was on the beach with a colleague observing siblings Brandy and Randy Standifer commercial fish. Both fished each summer mainly for sockeye and coho salmon. They were taught how to fish by their parents and were continuing the lifestyle. The Chinook salmon run was still good at the time and a few Chinook were harvested in a mainly sockeye fishery. The community had an ice machine at that time which would cool the fish quickly for the market in Anchorage. Today neither fishes commercially anymore. Both are too busy with permanent jobs now to commercial fish, they just couldn't make any money.

Harriet Kaufman, who now works full time for the NVT, started commercial fishing with her father at age 4; she did that until she was 17. After that, she commercial fished for 25 years off and on. The last time she commercial fished was the early 1990s. She stopped because she needed full-time employment to

raise her daughter. Harriet like many others left the fishery. She says management and regulations are the reason; commercial fishing openers have been cut so much that she cannot make a living. If you continue to commercial fish, she says you still need another job. That other job only works if you can get days off to commercial fish when there is an opener, which as she said are few now. She admits that the abundance of salmon is low and may be the reason for fewer openers.

Both Cook Inlet and Bristol Bay commercial fisheries are unique and have experienced different stressors in recent years affecting the opportunity for local residents to make a living. In Tyonek as noted, the low abundance and subsequent reductions in commercial fishing opportunity for Chinook salmon, a species that brings in a higher price than sockeye, has led some residents to leave the fishery. Most local residents primarily fished for Chinook for subsistence, however, commercial openers were also available on different days of the week for Chinook than subsistence and local residents of Tyonek would, when there was greater abundance of Chinook, take advantage of being able to fish for Chinook on these few openers when they were available, selling these larger fish for a higher price per pound; even the sale of a few Chinook would help cover early season start-up costs. Once the Chinook run ended and sockeye were being harvested fishing effort would mainly be expended in the commercial fishery. Sockeye salmon are abundant throughout Cook Inlet and with large scale fisheries in Kenai and Kasilof, as well as the set net fishery on Fire Island close to Anchorage, it is difficult to compete and few tenders make their way to Tyonek to pick up fish. The loss of this early season income from selling Chinook and fewer tenders buying fish in Tyonek has made the commercial fishery in Tyonek economically unviable in the short term. The abundance forecast for Chinook is low with little hope that commercial fishing for these high value species will return.

Kokhanok has had some decline in the number of participants in both the commercial and subsistence fishery, yet remains one of the highest harvesters today in the state for subsistence salmon (Holen and Lemons 2012). Roy Andrew of Kokhanok thinks that there has been a lot of change in amount of participation of both commercial and subsistence. He says that a lot of commercial permits held by community members were sold. He relates this to when elders retired and passed on their permits to their children. During a few bad years of fishing, the younger generation sold the permits. Subsistence has changed because less families do it. Roy said, "When I was in high school, every family would go set a net out, that was up until the 1980's. If you compare now the number of families that actually set a net you will see it has dropped; there are a great number of families that simply do not do that. Before it was like everyone went and did it. It has...changed." His father was a commercial fisherman and he continued in this tradition. But he didn't fish with his father, when he was old enough, he went out on his own and worked for himself. When he participated in the commercial fishery, he earned his entire income from fishing. "Back then the money you made from fishing was a lot different than today." He believes that people do not fish anymore because of low prices paid for salmon. An abundance of all highly-valued salmon species for the market, Chinook, sockeye, and coho, has meant that lower prices are paid, making it difficult to meet expenses in the Bristol Bay fishery, which is capital intensive.

However, Roy has hope for the future of Kokhanok. He says that "the community is steadily growing; it's always going to be here." Both the commercial and subsistence fisheries will continue to be a large part of life for people. He continues to live in Kokhanok because of his job as the environmental coordinator for the village. He said that if he didn't work anymore at his current job, he would still want to live in Kokhanok and that he would return to commercial fish. He thinks that Kokhanok is a fishing community, a community that is dependent on both commercial and subsistence fishing. Charlene Roehl of

Kokhanok says of salmon fishing both for commercial and subsistence, "it is very important to us, it's about the only way we live out here."

CONCLUSION: COMMERCIAL FISHING IS MORE THAN ECONOMICS

Commercial fishing is a way of life. It is a way of life that is passed from one generation to the next. In many communities, maybe not in the three core study communities, but in places like Chignik Lagoon and Haines, commercial fishing provides a significant portion of a household's income. But more than this, commercial fishing provides means for residents to live a lifestyle where they direct their own work in a vocation that allows them to remain in their communities off the abundance of locally available resources. It provides rural coastal residents in Alaska with a sense of freedom to direct their own destiny, as noted in the reasons that respondents said they continue to live in their communities. Several respondents in the core study communities commented that they entered the commercial fishery as children working on their boats operated by their parents. They grew up fishing commercially, gaining skills and knowledge and learning the value of hard work, qualities that would serve them well as adults directing their own fishing enterprises.

Each of the communities is unique with different experiences and reasons for the decline of the fishery in each location. Chenega Bay experienced the EVOS event which led many to leave the fishery at one point and they never returned. Those that did return migrated to larger fishing communities such as Cordova or Valdez or now live most of the winter in Anchorage, only returning to Prince William Sound in the summer to fish. Bristol Bay fishery canneries paid low salmon prices for several years in the early 2000s leading some in Kokhnaok to leave the fishery due to the overwhelming high overhead, especially for gill net boats. The fishery in Tyonek declined for several reasons. Competition from the higher

volume fishery in Kenai and Kasilof meant difficulty in accessing the market in Anchorage and Kenai. Flying out fish increased overhead, and in combination with higher fuel prices, meant a lower return for every fish harvested. Coupled with fewer openings for prized Chinook salmon, a larger salmon often seen as a gourmet species receiving a higher price per pound paid, led to lower profits in the fishery.

Although commercial fishing is not as lucrative for each community, there are efforts to revitalize this industry, which once was a way of life for many residents. Studies such as those by Lowe (2015) provide insight into the attitudes and perceptions of youth in coastal communities about commercial fishing, as well as other vocations that enable youth to remain in their communities. This study includes commercial fishing as a single component of a larger fishing way of life that includes both subsistence and commercial fishing. Both are intertwined in a mixed economy that embodies subsistence, culture, and economics. What is unique here is that this study attempted to unpack the complexity of single communities and compare them to each other, attempting to demonstrate that at least in Alaska, it is difficult for the economy and culture of one community to be a proxy for another. Through household surveys and key respondent interviews though, it might be possible to at least group communities, for example Chignik communities, or Kodiak Island, as long as there is some basic understanding as to what makes these fishing dependent communities unique at the socio-cultural level.

Chapter 7 – Discussion and Conclusion

Fishery Dependent Communities

Fishery dependent communities in Alaska are settings where residents value community and well-being through a sense of place that is about family, the subsistence lifestyle, and freedom. These themes emerged from all the study communities, both the core study communities and the comparative communities, especially in how people articulate the role of subsistence fisheries in their communities in response to the first research question which will be covered in more detail below.

To understand the diversity of factors impacting participation in commercial fisheries in Alaska, this research examined how residents value fishing and what these values suggest about the vitality of a community in overcoming these challenges. Respondents, while attributing great value to fishing and the economic benefits it brings, showed concern for the effect of a changing economy on their culture and traditional practices. In terms of commercial fisheries in thinking about the second research question on participation in commercial fisheries some of the economic changes stem from low salmon prices paid to commercial fishermen in some fisheries in the late 1990s and early 2000s, or from reductions statewide for commercial fishing higher value species such as Chinook salmon. In addition, participation in the commercial fishery became more complicated for residents of rural fishing communities after the implementation of the limited entry system in 1975 that administered permits for specific fisheries to those who could demonstrate an economic dependence and past participation in that specific commercial fishery, creating a regime where access to a fishery became a commodity (Langdon 1989:326). As local commercial fishing opportunities changed over time due to a diversity of factors including economic fluctuations in the market or species abundance, some small-scale fishers in

rural communities were unable to compete in this limited entry system. Small-scale fishers sold their permits in fisheries that were rapidly becoming more consolidated, where wealthier individuals in tribal communities maintained the economic capacity to leverage capital for larger fishing operations to compete in a competitive market. According to Reedy-Maschner, there are elements of ascribed status held by members of elite families in small communities where she works in the Aleutian Islands (Reedy-Maschner 2007:216). Members of these families received permits under the limited entry system and were able to hold onto the permits during times of economic downturn; families who also control elite political positions in the community further strengthened their control on the local fishery. This trend has been noted in Southeast Alaska as well (Dombrowski 2007; Langdon 1989). This situation exists within tribal social environments where social elites created through powerful kinship networks control access to the capital necessary to finance fishing (Schroeder 2003:438). In the three core study communities, it was economic conditions of the commercial fishery that mainly led to reduced participation, however each response to economic conditions was unique. In Tyonek, it was lack of access to the market for this small-scale fishery. This was partially driven by a reduction in opportunity to harvest Chinook salmon in the commercial fishery. Getting fish to market costs more as they must fly out their fish and with these added costs some residents have left the fishery. In Kokhanok, it was low salmon prices that led many to give up maintaining permits and the high overhead of commercial drift fishing, instead choosing to work as deckhands on other boats. In Chenega Bay, following the interruption of the Exxon Valdez Spill, the larger scale fishers chose to move to areas with larger fishing centers in Prince William Sound such as Cordova and Valdez hence, leaving Chenega Bay as a community to visit in the summer to maintain their ties to their family and sense of place. Although commercial fishing activity has declined, especially in Chenega Bay, at least there is a desire to pass this way of life

on to their children, as is the case in Kokhanok and Tyonek where their youth are encouraged to participate in commercial fishing.

There are challenges for youth entering a commercial fishery. For the younger generation, if they are not connected to the right kinship network in a community, there are significant challenges in raising the capital necessary to buy a permit and finance a boat to participate in the commercial fishery, especially due to neoliberal policies of effort limitation and privatized access to commercial fishing in Alaska over the past 35 years (Langdon 2015:1; Lowe 2015:3). Although Alaska is made up of a patchwork of small-scale fisheries, global salmon markets are increasingly connected and the system tends to be directed towards economic efficiency at a larger national and global scale. "Participants in a limited entry fishery might need to behave in a way that is societally desirable" (Hilborn, et al. 2004) to maintain access to local fisheries within the scope of the larger interconnected fishery in Alaska (Robards and Greenberg 2007). Based on observations by Langdon (1989), Reedy-Maschner (2007), Apgar-Kurtz (2015), Lowe (2015) and others, there are hurdles for young people entering the commercial fishery. As a younger generation is more disengaged from the commercial fishery, having not grown up fishing with family, and with the high cost of entry, there is less interest by youth (Donkersloot and Carothers 2016:34-35).

In Alaskan coastal communities, both subsistence and commercial fishing are part of life and the "shared habitus is transmitted by enculturation processes in childhood that orient community youth towards a fishing lifestyle" (Lowe 2015:3). Respondents from Tyonek talked about how they see more young people entering the commercial fishery, reporting that they are giving permits to their children when they come of age and are capable of taking over the family fishery. Inheriting a permit means lower fixed costs (Apgar-Kurtz 2015:75). It also provides youth the opportunity to grow up in the fishery increasing their knowledge, skills, and confidence in their ability to succeed. The Tyonek fisheries are

small set-net operations that utilize much the same equipment as subsistence fisheries and are therefore easier to access. Langdon made similar observations in Yakutat along Alaska's Southeast coast (Langdon 2015:6). For local residents, and youth especially, fishing provides a high level of job satisfaction as it fulfills a "self-actualization component that includes adventure and challenge" (Pollnac and Poggie 2006:330), as evidenced by John Standifer a respondent from Tyonek, who related how as a young person fishing "gets into your blood and you are hooked."

To maintain the connection to the community and the fishery, the community must be viable economically (Aarsæther, et al. 2004: 139). This means that fishing also needs to be an economical occupation so that children growing up in the community can follow their parents into this way of life. Like Tyonek, residents in Kokhanok relate that there is a new generation of fishers as young people enter the commercial fishery. Figures 1-2, 1-3, and 1-4 show a cohort of residents in the 20-40 age classes living in these communities. Residents hope that more young people will take over traditional roles in the community such as fishing. Hebert found that residents of Bristol Bay note that permits are still handed down through families and "many of these families are very proud to be part of the fishery" (Hebert 2015:76).

According to residents of all three core study communities, commercial fishing as an occupation provides a sense of value and identity. Residents said that commercial fishing is more of a way of life than a job; participants in other fisheries throughout the world hold a similar sentiment. Cinner discussed how in artisanal fisheries in East Africa, fishing is a preferred livelihood (Cinner, et al. 2008:128). Cinner describes how residents prefer to continue fishing even though they are starting to lose money as the abundance of fish stocks decline locally. Non-economic factors such as the continuity of a way of life contribute to high levels of job satisfaction in this East African artisanal fishery. Lowe

found that youth in coastal Alaskan communities prefer jobs that are hands on and outside, jobs where a person can be self-directed and independent (Lowe 2015:10). Most of the youth entering the workforce were either commercial fishers or had a family member who was a commercial fisher (Lowe 2015:18). In Southeast Alaska, Pollnac and Poggie found that, as expressed in the words of one Petersburg resident, "fishers define themselves by their job. If they couldn't fish, they wouldn't be themselves—they'd have no identity" (Pollnac and Poggie 2006:336).

Besides a sense of value and identity, commercial fisheries have important benefits economically as well as benefits to subsistence fisheries. In Alaska, commercial and subsistence fisheries are often inter-related as some fishing equipment such as boats are frequently used for subsistence fishing outside commercial fishing periods (Wolfe, et al. 2010:21). In addition, households with fishing permits are often also the households that are high producers of subsistence foods. In rural Alaska, a household's wild food harvest increases by 125.8% if the household is also involved in commercial fishing (Wolfe, et al. 2010:23). As with the study conducted by Wolfe, Burnsilver and colleagues also demonstrated that high-income households have a greater production of wild foods in the subsistence economy (BurnSilver, et al. 2016; Wolfe, et al. 2010). Burnsilver and colleagues found that in two coastal communities in Northwest Alaska, the highest harvesting households accounted for over 50% of the total wild food harvest in one community (Kaktovik) and over 40% in another (Wainright) (Burnsilver, et al. 2016:5). In terms of subsistence, harvests in Alaska are still relatively high compared to other Arctic areas (Poppel 2006:68). However, participating in a subsistence lifestyle is becoming increasingly more complicated as incomes in most rural areas in Alaska are less than in urban areas, and residents find challenges affording the material means necessary for engaging in subsistence, such as boats, fuel, and fishing nets. The harvest of wild foods in rural Alaska remains a key factor providing food security, but

the subsistence economy is intimately tied to the cash economy, leaving rural communities in Alaska vulnerable, especially with declining participation in commercial fishing by rural residents.

Production of wild resources in the three study communities allows residents to provide for other basic needs; replacing the wild foods with store bought groceries would not be feasible. During the study year, economic information was collected alongside harvest assessments to evaluate the harvest of wild food and replacement value of the three study communities (Table 7-1). In Kokhanok having to replace the cost of the harvested meat at $7 a pound, which includes the cost of purchasing and shipping meat or other replacement protein sources to the community, would be around half the annual household income. Residents already spend a third of their annual income on food in Kokhanok, and the analysis of Tyonek is similar. Economic statistics were not collected in the 2003 study in Chenega Bay.

Table 7-1. Wild food replacement values in Kokhanok, Tyonek, and Chenega Bay

Study Year	Community	Annual Wild Food Harvest per Household (pounds)	Estimated Wild Food Replacement Value per Household @$7/lb	Mean household cost of annual food purchases	Annual Household Income*	Resident responses of percentage of annual cash income spent on food
2005	Kokhanok	2,136	$14,952	$7,452	$30,007	24.8%
2005	Tyonek	614.5	$4,302	$6,764	$23,994	20.2%
2003	Chenega Bay	1,324	$9,267	n.d.*	n.d.*	n.d.*

Sources: Fall et al. 2006; Stanek et al. 2007; Krieg et al. 2009
* no data

Through interviewing local residents in three fishery dependent communities, this research found consensus that subsistence and culture were also highly valued benefits of fisheries, in addition to economics. Going back to the first research question about how people articulate the importance of subsistence, respondent Renee Zackar of Kokhanok said that she views Kokhanok as a successful fishing community. She went on to explain that today she fishes with her children, teaching them to fish as her

grandmother taught her. As she noted earlier, fishing with her family is important as fishing "helps kids form their identity" and it also teaches them how to work together as a group. "Everyone has to get along at fish camp" to make the harvest a success. "You have to help everyone, it's important for the entire community," she said. Renee values fishing because it produces an environment where all generations must work together at a time when her children are young and the apparent gaps between them in terms of age and sociability are the most significant.

During surveys many residents, when asked why they continue to reside in their communities, simply answered that it is home (Figure 5-1). When asked what "home" means, they explained that it comprises family, feelings of comfort and security, freedom, a quiet and peaceful environment, and a sense of community. Similar questions were asked in the Chignik area communities on the Alaska Peninsula. As a contrast to the three core study communities, in Chignik, residents of all four communities maintained that family, home, and subsistence were the dominant reasons for continuing to live in their communities (Figure 7-1). Jobs were also important though, and as shown in Figure 6-5, there are several residents in all four communities who get income from commercial fishing. In the fishery dependent community of Kodiak City, many residents said their job was one of the reasons for staying in the community, both within the sampling strata of fishery permit holders and the general population. However, in Larsen Bay and Old Harbor, the two more rural communities on Kodiak Island, these responses were less frequent with sentiments of home, subsistence foods, the environment, and quality of life more common (Figure 7-2). According to Carothers, who has conducted research in Kodiak Island communities, "as more families leave their home communities in search of work, the links between place and people become more symbolic than experienced (Carothers 2012:158). Supiaq

fishermen from across the region are consistent in their stories and their certainty that without salmon and salmon fishing, their communities would not exist."

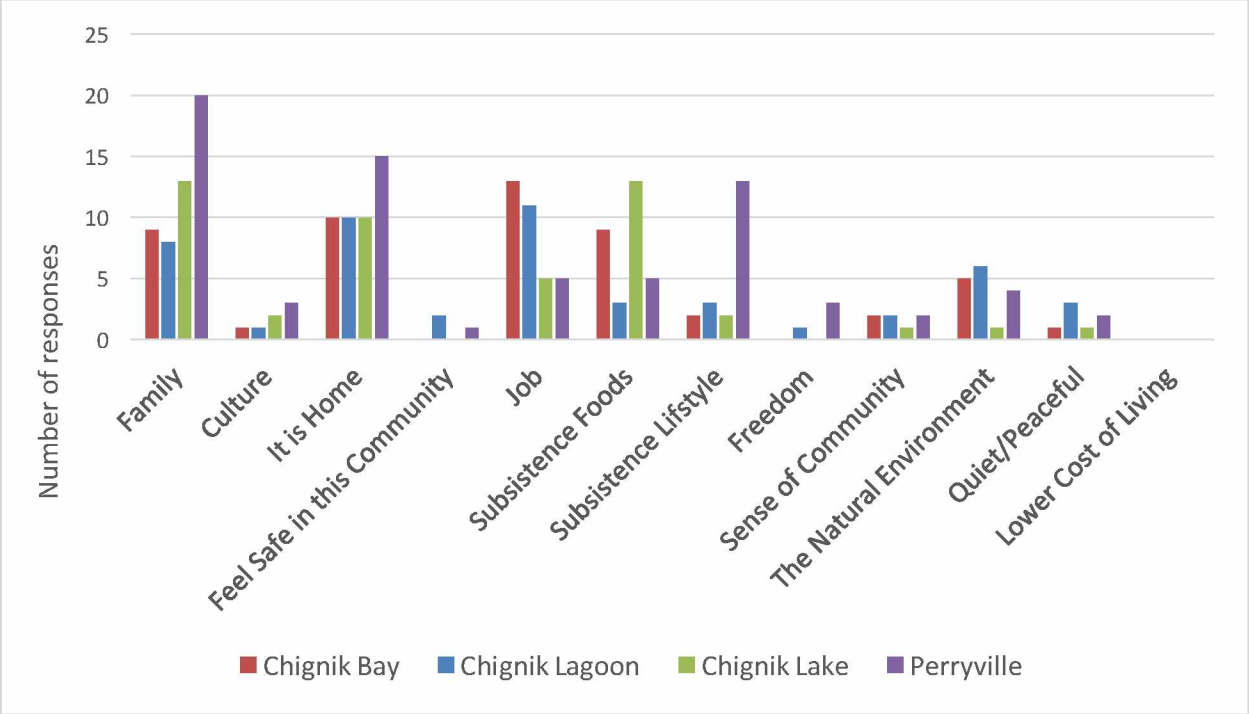

Figure 7-1. Reasons to continue residing in the community, Chignik Bay, Chignik Lagoon, Chignik Lake, and Perryville

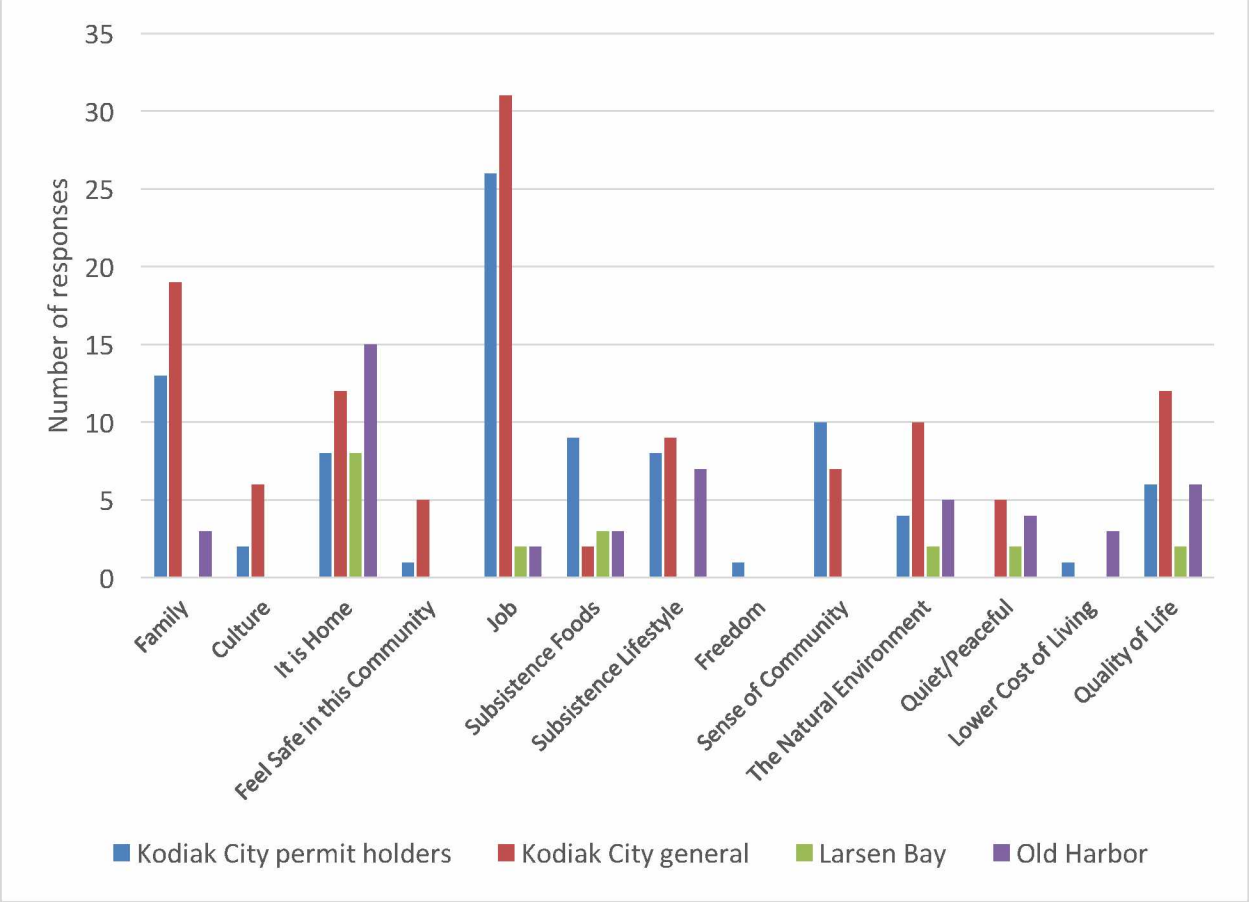

Figure 7-2. Reasons to continue residing in the community, Kodiak City, Larsen Bay, and Old Harbor

Residents of the three core study communities articulate that they seek to continue to be fishing communities. A similar sense could be drawn from the responses in Chignik and Kodiak as well as other research. Residents want to continue to pass on fishing to the next generation, so fishing becomes part of the experience, the shared habitus as Lowe described, and does not simply become symbolic as Carothers noted (Carothers 2012; Lowe 2015). The way in which participation in fisheries occurs may shift over time between involvement in the commercial and subsistence fisheries. The values expressed by community members about the satisfaction that fishing brings to them and their families, whether

it's in the commercial or subsistence fishery, demonstrate how fishing benefits rural communities in Alaska in terms of economy, cultural continuity, and giving residents a sense of place and identity.

SES Approach

Resilience and vulnerability were a lens employed in this research to view economy, subsistence, and culture, and how this creates well-being for communities and families in fishery dependent communities in Alaska. Other studies have approached fishing communities in much the same way. Poe and others, in their review of cultural dimensions of socioecological systems, found that in coastal ecosystems in North America there were five interrelated areas of cultural importance: "meanings, values, and identities; knowledge and practice; governance and access; livelihoods; and cultural interactions with the biophysical environments" (Poe, et al. 2014:166). According to Blount and others, in their study of the Gulf Coast of the United States, "by focusing on specific domains within fisheries and by tapping into local, experientially-based and shared knowledge, members of fishing communities can provide accurate and insightful accounts of their resilience, vulnerability, and sense of well-being." Studies such as this "can be an important tool-kit in mixed-methods research to develop management and policy considerations… collecting information that is timely and direct" (Blount, et al. 2015:13).

This research sought to demonstrate that fishing communities are adaptive within the marine social–ecological system through adaptation to economic and abundance related factors, changing gear types and species of salmon harvested, changing community patterns, and ultimately, the restructuring of the way the coupled system interacts (Perry, et al. 2011:439). Folke (2006:260) emphasized that the resilience approach is concerned with how to persist in the face of change and how to innovate and transform into new, more desirable configurations (Broderstad and Eythorsson 2014). Communities

such as Chenega Bay, Kokhanok, and Tyonek, although all unique in their subsistence and commercial fishing economies, are similar in their capacity to adapt as residents ultimately want to maintain communities where they can live successful lives, raising their children in an environment where they have subsistence opportunities and are close to family. According to Escobar, "people engage in the defense of place from the perspective of the economic, ecological, and cultural differences that their landscapes, cultures and economies embody in relation to those of the more dominant sectors of society" (Escobar 2008:6; Carothers 2012:136). Residents of these communities incorporate diverse types of ecological knowledge in the conservation and practice of fishing in their communities, and collaborating with these knowledge holders can build social and ecological resilience in the system (Poe, et al. 2014:169). Passing on that knowledge to future generations allows for the community to continually adapt to changes and be successful in the subsistence economy (Berkes, et al. 2000).

Leonard Allowan of Tyonek wants to raise his boys to live off the land and waters near the community, to learn about life much as he once did. To him, fishing is one fundamental basis of the local subsistence economy and an important part in passing on his knowledge of how to survive in rural Alaska. He believes that fishing will continue to be a large part of life for the community. "It's the only life I know," Leonard said. As Reedy-Maschner noted in her work in Nelson Lagoon and False Pass in the Aleutian Islands, "relations are structured by access to the salmon fishery, where men strive to be boat captains or crew on top boats, women seek out successful fishermen as partners and many fish themselves, and children want to follow in their parent's footsteps" (Reedy-Maschner 2012:117). Lowe found of her study of youth in Southeast Alaska and Kodiak Island that the perception of living in one's coastal community where youth live within and in close proximity to the natural environment and where one can seek jobs that allow them to remain in their community while working outside is highly sought and

valued, and habitus becomes part of one's identity; this connection to one's community and place (Lowe 2015:9). These collective ideas demonstrate a desire within communities to promote resilience in order for communities to be places where people live out meaningful lives (Martin 2015; Wilson 2012).

Assessing Resilience and Vulnerability

An ethnographic approach to resilience and adaptation shows the importance of culture, family, and place from the perspective of the emic, or insider's perspective, instead of studies using quantitative analysis to measure community viability. An ethnographic approach documents how community members define resilience. Quantitative studies remove the human aspect of community well-being. For example, Himes-Cornell and Kasperski used 35 variables to describe resource dependence and vulnerability of Alaskan communities (Himes-Cornell and Kasperski 2015). "We've assumed household income positively affects adaptive capacity while having a high percentage of the population in poverty will result in a lower level of adaptive capacity (Cutter et al., 2003 *In* Himes-Cornell and Kasperski 2015). Communities with high poverty rates (i.e., large positive factor loading) and low household incomes (i.e., small negative factor loading) will have a very high index score for the poverty component and a high index score for the adaptive capacity index, which implies that low adaptive capacity leads to higher vulnerability" (Himes-Cornell and Kasperski 2015:5). The goal of the study by Himes-Cornell and Kasperski is to provide multiple indicators that best predict resilience or vulnerability of a community to provide fishery managers a "broader awareness of the threats each community faces and the ways in which their actions will likely affect each community" (Himes-Cornell and Kasperski 2016:37). Demographic characteristics that make communities more vulnerable, and received higher vulnerability scores in this study include communities with higher diversity (non-white), more female heads of households, higher percentage of residents below age 5, and a higher percentage of residents who do

not speak English (Himes-Cornell and Kasperski 2016:44). Also measured were various factors of fishing involvement including commercial fishing, commercial processing, and subsistence activities. They found that higher fishing involvement scores correlated with communities that had lower vulnerability scores, "which implies that communities with higher fishing involvement have lower incidence of social problems;" fishing (commercial, sport, and subsistence) is linked to community well-being as many rural communities are isolated and have less access to alternative economic opportunities (Himes-Cornell and Kasperski 2016:51). Higher social vulnerability scores are correlated with communities that have higher populations of Alaska Natives, more children, and communities where there is a higher percentage of people who do not speak English well (Himes-Cornell and Kasperski 2016:52).

In terms of social indices, with a higher score being a more vulnerable population, on a scale of 0-4, Kokhanok scored the highest (4) in terms of vulnerability of all the study communities, both the core study communities and comparative communities. This was followed by Old Harbor and Tyonek with scores of 2, Angoon, Chenega (Bay), Chignik Lagoon, Chignik Lake, Chignik, Hydaburg, Larsen Bay, Perryville, and Whale Pass with a score of 1, and Haines, Hoonah, and Kodiak with a score of 0 (Himes-Cornell and Kasperski 2016:59-64). High fishing involvement resilience indices, with 5 being the highest score and 0 the lowest were given for Kodiak (4), Chignik, Hoonah, Larsen Bay, and Old Harbor scored a 3, Haines and Hydaburg 2, Angoon, Chignik Lake and Perryville 1, and Chenega, Kokhanok, Tyonek, and Whale Pass scored a 0 (Himes-Cornell and Kasperski 2016:65-70).

Based on this analysis using quantitative indices, without any qualitative ground truthing of the data, it appears that of the three core study communities, Kokhanok is the most vulnerable socially, with Tyonek receiving a mid-range vulnerability index, and Chenega Bay the lowest vulnerability index score. Table 2-1 shows that all three have high Alaska Native populations, fairly small household sizes, and

Figures 2-4, 2-5, and 2-6 show that Kokhanok has the most even distribution of ages, followed by Tyonek, and then Chenega Bay. Based on an analysis of the survey responses, all three communities view fishing to be important to their communities and report that family, culture, a sense of home, and the subsistence way of life are the main reasons why they remain in their communities (Figure 5-1). Figure 5-2 shows that jobs and educational opportunities are reasons why residents might consider leaving their communities, especially in Kokhanok and Tyonek. However, based on an analysis of the qualitative interviews, the reasons to remain in the community far outweigh the reasons to leave.

Therefore, in many ways, Kokhanok and Tyonek are some of the most vibrant communities, demonstrating high community well-being. Culture, embedded in Alaska Native society, is important for these communities and is a factor of well-being, not vulnerability. Communities like Tyonek are places where there are multi-generation households led by women who are tied to a large kinship network within the community. A domicile may have two generations of family living within it, a mother and her children, but this statistical analysis ignores that next door is another domicile with grandparents, or aunts and uncles who help raise those children, followed by households with siblings, cousins, and others as part of an extended kinship network. Extended families in these communities, working together a fish camp for example, also work together to educate and raise children. These multi-family kin networks make a community less vulnerable, not more.

Language is a way to transmit culture from one generation to the next and having a community where English may not be always spoken in a household does not make a household more socially vulnerable. Quantitative studies creating social indicators of vulnerability assume that rural communities in Alaska are more vulnerable if they are not similar to urban communities. What this ignores is that rural communities are unique, not just as a subset of communities, but also unique from one another. For

example, when reviewing the responses from the Chignik area communities, some of the communities such as Chignik Lagoon are more dependent on the commercial fishery, yet that job is not the only reason residents continue to reside in that community (Figures 6-5 & 7-1). Active participation by a majority of residents in the commercial fishery does not equal fewer social problems.

Quantitative studies such as this one carried out by Himes-Cornell and Kasperski in Alaska measure resilience and adaptive capacity based on natural resource dependence as well as other economic factors such as employment, income, and transfer payments. "Resource dependence becomes a significant issue for communities when they are mostly, if not completely, dependent on subsistence fisheries for sustenance, [and] have a low level of adaptive capacity" (Himes-Cornell and Kasperski 2015). However, it is recognized that economic and social vulnerability, as measured through statistics, needs to be ground truthed against the real world by comparing qualitative ethnographic data for a representative sample of communities to their respective quantitative index rankings as scored by researchers (Himes-Cornell, et al. 2016:54). Comparing the qualitative and quantitative data collected by this research using three core study communities with the scores as presented by Himes-Cornell, there is minimal correlation for Chenega Bay, and no correlation for Kokhanok and Tyonek. "It is possible that variables used to develop an index may adequately represent the characteristics of one community, but fail to represent other characteristics present in another community" (Himes-Cornell, et al. 2016:55). I would argue the characteristics of ethnicity, family structure, language, and a western mode of production are not the best characteristics to measure community resilience in rural Alaska.

In terms of salmon fisheries as important components of the social-ecological system, what is missed in this quantitative analysis, and with the system overall, is that "society now differentiates sustainability of salmon as an economic commodity over salmon as a keystone of ecological (e.g. bringing nutrients

into rivers) or rural community health (bringing economic opportunities to rural communities)" (Robards and Greenberg 2007). This ignores the fact that salmon live intertwined lives with residents of rural coastal communities in Alaska. Measuring adaptive capacity of a community through statistics collected by agencies in Alaska will not adequately describe the adaptive capacity of a community, nor will it adequately measure the cultural dimensions of the ecosystem. "Because cultural dimensions are often interwoven and may be difficult or unwise to disentangle, interpretive and inductive empirical methods may be the most helpful explanatory models" (Poe, et al. 2014:173). These methods include ethnography, such as discourse analysis derived from face to face interviews, as well as surveys to provide the basis for some statistical analysis. As Lyons noted "it is important to remember that social and socio-cultural data are complex and that reducing their complexity for the ease of integration into standard analytic approaches greatly reduces their usefulness" (Lyons, et al. 2016:9). "Locals value their community and the way-of-life it affords them—a slower pace of life, less crime, a sense of community, natural beauty, and their ability to lead a subsistence way of life" (Lyons, et al. 2016:8). Lyons, Carothers, and Reedy instead propose assessing community vulnerability from an ethnographic standpoint in what they call means, meanings, and contexts, identifying the way of life, sense of community and place, and history and future of a community through an ethnographic method (Lyons, et al. 2016).

To examine methodology for assessing community vulnerability and resilience within a larger system, the goal of the third research question, this research used quantitative data through surveys to provide a basic statistical assessment of the economic and subsistence landscape of coastal communities in Alaska. This includes survey questions that attempted to understand how communities build resilience within the framework of a social-ecological systems and why fishing is important for subsistence,

culture, and economy. But this was only the first stage and only through actual interviews where residents could tell their own stories could a broader more accurate assessment of resilience and the complexity of community based fisheries be assessed. Salmon and other marine resources are an important part of this resilience even in economies that may be perceived as vulnerable.

As Carothers found on Kodiak Island, although local economies are becoming less connected to commercial fishing, subsistence practices as well as individual and community identities formed on attachment to place still embody the close connections to salmon and marine resources (Carothers 2012:136). According to Renee and Greg Zackar of Kokhanok, salmon are "very important because we come home after making money off of it and we eat it, and we've been doing this since we were a little kids; it's just what we do." The livelihoods they were born into in Bristol Bay, harvesting salmon in the commercial fishery and then coming home to harvest salmon in the subsistence fishery are livelihoods they will continue to instill in their children to ensure the future of their family, community, and the Bristol Bay region.

Broad Application

This research examined features of the social-ecological system of the three rural coastal fishing communities in Alaska. These are communities embedded in complex social-ecological systems where residents interact within the management scheme to meet their needs for harvesting salmon for subsistence. Management actions and the current neoliberal policies of commercial fishing in a globalized economic landscape have affected the cultural, social, and economic features of the social system. A great deal of recent research has focused on small-scale fisheries such as those found in Maine, Mexico, and Newfoundland, as well as some larger fisheries such as those found in Iceland and

Alaska (Dyer and McGoodwin 1994; Palsson 1994). The research shows that in fisheries and marine ecosystems, humans are integral and interdependent components. This includes cultural, management, economic, and socio-political components that are highly inter-connected and interactive. Changes in marine ecosystems have impacts on, and consequences for, human communities that depend on these systems, and how human communities respond to these changes has reciprocal impacts on marine ecosystems (Perry and Ommer 2010:739).

Anthropologists working in the field of fisheries management examine the culture and traditions of fishing, particularly the social norms and group decision-making in small-scale fisheries (Hilborn 2007:287). Describing social-ecological systems through the lens of resilience can be accomplished by understanding the dynamic interaction between nature and society through "case studies situated in particular places and culture" (Berkes and Jolly 2001). In this study, case studies were used as a guide to understand how users of the subsistence salmon fishery modify their rules of interaction with the environment to ensure their livelihoods.

Using the lens of resilience is one promising tool for analyzing adaptive change towards sustainability as it provides a way for analyzing how to maintain stability in the face of change. According to Berkes, "a resilient social-ecological system, which can buffer a great deal of change or disturbance, is synonymous with ecological, economic, and social sustainability" (Berkes, et al. 2003a:15). Fisheries managers need to take into account that managing social-ecological systems for long-term, sustainable outcomes is difficult as researchers cannot forecast the future in any meaningful way as there are too many uncertainties (Berkes, et al. 2001). If fishery managers more fully understand the system and the users of the system, then they and users can jointly plan for disturbances and adapt in a way that influences

the resilience of the system. Fishery managers though need to acknowledge and incorporate local knowledge into the management regime.

Creating a juxtaposition of another fishery that is completely different than those found in rural Alaska might provide some interesting insights on how to measure resilience in fisheries. Hammer examined tacit local knowledge that can be directed towards ecosystem processes and functioning which could be important for maintaining a sustainable system (Hammer, et al. 2003:539). When examining fisheries as social-ecological systems, fishers at the local level need to be included as knowledgeable users of the ecosystem as they involve themselves in the feedback loop that supports management by their very act of participating in the fishery. Thus, research is necessary to accumulate and sustain ecological knowledge and understanding, and respond to changes in ecological systems to build adaptive capacity in the social-ecological system (Hammer, et al. 2003:540).

A broad application of this research methodology of working directly with communities to measure and understand their adaptive capacity using an ecosystems approach to fisheries is case studies from Finland, Sweden, and Norway. These are northern fisheries in more highly populated areas than Alaska where there are competing user groups who all identify as fishers (Almlöv and Hammer 2006; Broderstad and Eythorsson 2014; Hammer, et al. 2003). In these northern countries, presently commercial fisheries have a marginal role in the respective national economies, although recreational fishing has become more common. For example, between 1963 and 2000 the number of recreational fishers in Sweden has increased from 1 million to 2.3 million (Almlöv and Hammer 2006). In Finland one-third of the Finnish population participates in recreational fishing as a leisure activity (Hammer, et al. 2003:536). Hammer examined the role of socio-economic drivers in shaping current use patterns in the Central Baltic region that spans Finland, Sweden, and a semi-autonomous region of Finland, the

Åland Islands (Hammer, et al. 2003). Although commercial fisheries are declining as the region becomes more connected to the larger population centers and fishing for a living is no longer the primary income earner for local residents, there is a shift to a mixed economy of a diverse fishery including user groups who rely on fisheries resources for commercial fishing and subsistence, summer guests who spend prolonged periods of time in the region sport fishing, and tourists and occasional users who sport fish and use the region for natural setting. Much of the region was managed by private individuals, organizations, or the government until relatively recently. For example, in Sweden there is the concept of "everyman's right," a customary law granting public access to private lands and waters. In 1985, this right was further expanded with an act granting, free fishing with handheld gear such as a rod and reel. In 1996, in Finland this legal concept was also introduced so that citizens have the right to fish for free in most private waters except protected areas. In Åland, residents have the right to fish on waters belonging to their home municipality and the general public can purchase a license to fish (Hammer, et al. 2003:535). These three regions demonstrate a diversity of managed areas including individual, common property, and municipality or state property which is also demonstrated in other parts of the region (Almlöv and Hammer 2006). Fisheries are important and diverse in the larger region for sport, commercial, subsistence, recreational, and fish farming. Fish contribute to several diverse ecosystem services, "thus the maintenance of the life-supporting ecosystem supporting fish as well as the role of fish for maintaining ecosystem functions are important in a long-term management perspective. This links the fisheries sector to the role of the fish community for the maintenance of functional diversity and resilience of the archipelago system" (Hammer, et al. 2003:535).

It can be argued that current user patterns of fish resources in the archipelago, to a large extent, are the result of underlying socio-economic driving forces only vaguely connected to coastal fish resources

which emphasize need for cross sector and cross-scale management approaches. From being societies largely dependent on the local natural resource base, where feedback signals from the ecosystem were fairly direct, the archipelago communities are now more indirectly depending on the local life-supporting ecosystem. Nevertheless, functioning ecosystems are still the basis for the delivery of ecosystem services, both demand-driven such as recreational service, or fundamental, such as nutrient recycling or provision of spawning grounds (Hammer, et al. 2003:538).

Some results of a study that looks at user groups in a shifting economic and social environment where fishing has moved from a commercial and subsistence endeavor to a recreational, and in some cases industrial endeavor with the introduction of fish farming, include the question of how germane is local ecological knowledge to management. Hammer ask the question, "is there tacit local ecological knowledge directed towards ecosystem processes and functioning that would be important for maintaining a sustainable archipelago system, that is presently not accumulated or incorporated into feedback mechanisms supporting management" (Hammer, et al. 2003:539)? By examining fisheries as social-ecological systems, fishers at the local level need to be included as stakeholders and engaged in direct research as knowledgeable users of the ecosystem.

Lack of ownership has become an issue as commercial and subsistence fishers, once the major users of fisheries resources in areas such as this that are under transition, made daily observations of the status of the fishery and regulated themselves for their mutual benefit. Occasional users and a changing demography of fishery users, along with new industries such as fish farming, create uncertainty in a social-ecological system. Thus, governance is necessary to "accumulate and sustain ecological knowledge and understanding, and respond to changes in ecological systems, i.e. to build adaptive capacity, [which] relies on a range of decisions at different levels" (Hammer, et al. 2003:540). Like in

Alaska, it needs to be recognized that communities are unique and dynamic, and addressing communities at the individual level instead of as user groups provides a more useful understanding of addressing community resilience.

This research sought to understand the long-term viability of subsistence economies in general and community well-being specifically as it applies to coastal communities in Alaska. Whereas other studies such as the Arctic Social Indicators study (Larsen, et al. 2010), the follow-up to the Arctic Human Development Report (2004), and work in the Gulf Coast (Jacob, et al. 2010) attempted to understand community well-being through a set of statistical factors, this study used index communities to understand the context of cultural well-being in northern communities, and how communities define resilience. Each of the three core study communities is unique in their social, cultural, and economic composition. It is recognized that a drawback of the methodology of using surveys and key respondent interviews to understand community well-being and community resilience does have limitations as it would be difficult to expand to a large set of communities such as all coastal communities addressed by Himes-Cornell (2015) for example and might be more appropriate for a smaller subset of communities such as those addressed by Lowe (2015), Carothers (2015), and Reedy (2012). However, if a small study such as this was completed it could provide locally meaningful approaches and indicators designed to evaluate cultural and economic well-being associated with different social-ecological systems (Poe, et al. 2014:173). This project addressed specifically northern rural fishing communities that have a well-established participation in the commercial fishing industry and a strong subsistence base to maintain adequate food security. Findings demonstrate that in all three case studies, and those of the comparative communities, there are commonalities that could be measured through a more formal statistical analysis. Conducting a rapid assessment of community resilience and vulnerability through

ethnographic studies incorporating face-to-face surveys and semi-structured interviews, as a follow-up to a statistical analysis of a large set of coastal communities as described through social indicators, could improve the development of methodology used in indicator studies (Himes-Cornell, et al. 2016:63).

This study could be applied to fishing communities in other parts of the north such as those investigated by Nuttall in Northwest Greenland or the Northwest Coast where residents are invested in both the subsistence and commercial fishing economies (Boxberger 1989; Nuttall 1992). The use of index communities to describe general patterns in a larger region does have the drawback that the index community may not accurately represent every community, as all communities are unique. However, in many cases in coastal communities in Alaska and elsewhere in the North there are more similarities between communities than differences as people are drawn to these places and remain due to the way of life and opportunities to raise their families and live meaningful lives.

SALMON, PEOPLE, AND PLACE

So back to the key question I had back in 2009 at the Alaska Board of Fisheries meeting in Anchorage. Listening at the Board meeting that people were having a hard time making a living, what I missed was that this area of the state is rich in fish, fishing history, and fishing culture. That was the point of the testimony. I had to turn the question around to understand that it is the fisheries that make these communities resilient. Residents having a hard time making a living was only one part of the conversation. It is now evident that residents of rural Alaska coastal communities value their fishery for the lifestyle it provides and were seeking opportunities to safeguard a way of life that allows for living meaningful lives in their communities, while ensuring a future in the fishery for their children. One respondent interviewed by Carothers in Kodiak answered similarly to comments heard in Bristol Bay by

saying, “without salmon, the Kodiak villages wouldn’t exist” (Carothers 2012:133). Carothers goes on to say, “the singularity and importance of such a resource was, of course, difficult for people to articulate. Salmon are so commonplace, so unquestionably part of daily life, and so vital that they easily become submerged in thought and expressive culture.”

Small communities in Alaska are places where people choose to live for the subsistence lifestyle. Although questions were asked of residents that attempt to quantify common responses to why they continue to live their lives in these small coastal fishing communities, it was through the in-depth ethnographic interviews that residents could fully articulate how their lives are intertwined with those of salmon. In Chenega Bay, Dennis Zackar and Tom Sherman both comment on how the lifestyle is part of why they both choose to remain in Chenega Bay. Chenega Bay is within the heart of Prince William Sound, easy access by boat to fishing and hunting opportunities, an environment plentiful in wild resources, especially fish. Chenega Bay is still a fishing community they say although, not quite what it used to be, but residents are still dependent on fish. “Everyone eats fish,” said Dennis. Everyone is involved in the subsistence fishery in one way or another and the commercial fishery is vital for the livelihood of the region, they said, which was also articulated by other respondents in Chenega Bay. They both plan on staying in the community, because of the lifestyle. Chenega Bay is quiet, it is peaceful, and it is safe.

Salmon and fishing as a way of life for people is vital for community vitality and well-being. Roy Andrew says that Kokhanok is "steadily growing, it's always going to be here." He thinks that both the commercial and subsistence fisheries will continue to be a large part of life for people. To him, Kokhanok is a fishing community and salmon are an important part of their way of life. In the Eastern Aleutians, Reedy-Maschner noted that residents locally perceive commercial fishing as the indigenous

commercial economy, "because even though subsistence practices are essential cultural markers, they define themselves as commercial fishermen… fishing sustains the village where the whole community weaves subsistence and commercial practices together, supplying fish and other wild foods to households, affirming their roles and responsibilities to one another, and negotiating status throughout" (Reedy-Maschner 2007:213).

Art Standifer of Tyonek makes a statement that embodies many of the comments that were heard through the course of this research. "Tyonek will exist forever and fishing will always be a part of the community… I was born and raised here, this is my home." He is content with life in Tyonek. Fishing each summer has been and continues to be a big part of life for him and his family. Fishing together as a family and as a community reaffirms the responsibility that each community member has to one another. His extended family must work together at fish camp and his community must work together to maintain fishing opportunities. Every summer at his cabin at Robert's Creek, Art settles in to fish for subsistence in a community that to him is a fishery dependent community.

But there are challenges, especially as local participation declines in some communities. According to Carothers, "this rapid decrease in fishing participation has brought about challenges to the subsistence economy which depends heavily on access to commercial fishing; village depopulation; economic and social displacements; and an 'in-between' or lost generation of young people, the majority of whom are not involved in fishing-based livelihoods" (Carothers 2008; Carothers 2010:98). This research showed that residents do not view a lost generation of youth in commercial and subsistence fisheries. Although there are challenges, youth involvement and interest in fishing both for economy and subsistence is consistent and appears to be growing with residents of at least two of the three study communities, Tyonek and Kokhanok, articulating a desire to ensure this economy and way of life continue.

Through interviews for this research, respondents maintained they continue to involve their children in the subsistence fishery, young people are taking over roles in the commercial fishery, and they have hope for the future of their communities. Art's sister Harriet Kaufman says that fishing will always be a part of the community. There have not been many changes over the years in Tyonek, which she finds comforting. There are still many opportunities to fish, camp, and hunt and all of these opportunities are available close by and it costs very little to participate. Harriet observes many young people participating in the commercial fishery and thinks the younger generation is working hard to start taking some ownership of the local commercial fishery. She does not think the reason though is just to make money, "it's just something that's in their blood. It's something that was handed down to them by their parents." As Harriet says, "that is why we are called beach people."

CONCLUSION

Residents of these small-scale coastal communities have a strong connection to salmon as a valuable resource for their way of life, and this factor is accounted for in their personal decision making processes of whether to continue living in their rural communities. Continuing to fish for subsistence is seen by residents as a way to maintain culture. Residents interviewed in Chenega Bay, Kokhanok, and Tyonek articulate the role of subsistence fishing in their community as passing on knowledge and culture to their children. The practices involved in fishing (preparing gear, setting out gear, waiting, processing, etc.) involve families working together to continue their subsistence way of life and develop a unique set of values surrounding the practice of fishing. These values placed on subsistence fishing provide support for their subsistence way of life and the continuity of their culture. The subsistence lifestyle is a major reason for continuing to live in these communities; however, there are also other important factors that arose during research. Many residents, when asked why they continue to reside in their communities,

answered that it is home (Figure 5-1). When asked what home means, they explained that it comprises family, feelings of comfort and security, freedom, a quiet and peaceful environment, and a sense of community. What was interesting though was that these responses were consistent across communities, but there were also differences as well. Each individual family must negotiate the multitude of stressors that arise by living a rural lifestyle, and find that the continuity of the way of life a rural lifestyle provides outweighs the stressors produced by economic and social pressures.

This project began with data that I have collected over 15 years working in coastal communities in Alaska. Exploring the topic of fishery dependent communities, I collected additional quantitative data to provide the baseline necessary in assessing the economic and subsistence landscape of coastal communities in Alaska. This included questions that attempted to understand how communities maintain resilience and why fishing is important for subsistence, culture, and economy. This data set was then expanded through face-to-face interviews with key people in each community so they could tell their story of their family's intertwined lives with salmon and their homeland. This research demonstrates that only through a methodology that includes interacting directly with local residents to document the resilience of fishing communities in coastal Alaska and the complexity of community based fisheries, can we seek to understand the importance of subsistence, economy, and the passing on of traditions to residents of fishing communities in their cultural landscape. Assessments of community well-being are best understood through the lens of the community, instead of a top down approach of assessing vulnerability based on studies conducted in other coastal communities in the United States. Alaskan communities are unique, both different from other regions of the United States but also there are differences between regions of Alaska.

One of the most interesting aspects of this research was using three communities instead of one as a case study. As questions were asked across communities it became apparent that there were differences. A decline in participation in the commercial fishery for example was consistent in the three communities, but the reason for that decline was unique to each community. Subsistence fishing as a family and community activity was unique in all three communities with commonalities between Kokhanok and Tyonek and major differences in the method of fishing with Chenega Bay, yet the importance of the fishery to all three communities was consistent. As the survey results were examined, it became apparent that the baseline should be expanded to other regions of coastal Alaska if possible to gather some basic statistics on which to understand commonalities and differences between regions. These additional surveys administered in the Chignik area, Kodiak, and Southeast Alaska also showed wide variations in participation is subsistence and commercial fishing. Some communities showing high participation and income in commercial fisheries and some little to no participation. In the study communities factors impacting participation in commercial fishing challenges were unique such as globalization of salmon markets affecting prices in Bristol Bay, access to markets to sell their fish in Tyonek, and difficulty of entering a capital-intensive fishery in many fisheries across Alaska. Results of subsistence participation was somewhat more consistent across coastal Alaska with some showing very high levels of participation and others only moderate. These findings were then compared to results from other studies, both quantitative and ethnographic to understand if there could be common themes throughout to assess resilience and vulnerability of such diverse fishing communities in Alaska. Using quantitative data about one community or region does not tell you the entire story about fishery dependent communities in Alaska, nor does it give you an accurate portrayal even of a single community. These are communities of families and cultures and each is unique. Using more than one as a case study helps to understand these differences. When the capacity is available to do research in

more than one community, this methodology should be employed. The second lesson is that communities should be allowed to tell their own stories, not examined through quantitative analysis. Vulnerability and adaptive capacity are not values equitable with culture and well-being; culture and well-being are values more easily understood at the local level. The measure of vulnerability and adaptive capacity, the ability to maintain resilience, should be derived from measures set by working closely with a community on how they would define resilience. Finally, coastal communities in Alaska are adaptive and a long-term view based on longitudinal data should be used to understand their adaptive capacity; not single snapshots in time. The resilience of a community should be measured on a longer time scale. Coastal communities in Alaska have long histories embedded with memory, intertwined lives lived with the water, land, and resources on which their livelihoods are built. Fisheries resource abundance and the intertwined economics of these resources have changed over time, but people adapt because they have social memory, and a desire to pass this memory on to the next generation. Chenega Bay, Kokhanok, and Tyonek, as well as the other communities examined in this research are composed of resilient people who honor their past and are preparing for their future.

On a statewide scale, each fishery in Alaska has unique challenges and benefits. However, a commonality that can be found in fishery dependent communities in Alaska is that salmon fisheries are for many a way of life linking commercial and subsistence practices to family, traditions, and a sense of place. Fishery dependent communities are places where residents value community and well-being through a sense of place that is about family, the subsistence lifestyle, and freedom.

How well a community can adapt to changing fishing opportunities is an indicator of community resilience. Policies need to consider adaptive responses that maintain the intersection and diversity of marine ecological and human fishing societies (Perry, et al. 2011:446). Chenega Bay, Kokhanok, and

Tyonek have been able to adapt their dependency on fishing over the past century as their economies and cultures went from completely subsistence based to an interrelated economy of subsistence and commercial fishing, formulating economy and identity for their families, their community, and their culture. Residents continue to view fishing as important for the continuity of culture. As one resident of Kokhanok who participates in both commercial and subsistence fishing said, fishing is a "part of our sense of identity, it's who we are."

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SALMON SUBSISTENCE SURVEY

KOKHANOK, ALASKA

January to December, 2011

This survey is used to estimate subsistence harvests and to describe community subsistence economies. The survey is being used as part of a project to research successful fishing communities in Alaska. We will publish a summary report, and send it to all households in your community. We share this information with the Alaska Department of Fish and Game, the U.S. Fish and Wildlife Service and the National Park Service. We work with the Federal Regional Advisory Councils and with local Fish and Game Advisory Committees to better manage subsistence, and to implement federal and state subsistence priorities.

This project will be guided by the research principles adopted by the Alaska Federation of Natives in 1993. This research will also follow the University of Alaska Fairbanks Institutional Review Board policy governing human subjects research.of Subsistence, ADF&G.

We will NOT identify your household. We will NOT use this information for enforcement. Participation in this survey is voluntary. Even if you agree to be surveyed, you may stop at any time.

HOUSEHOLD ID:		
COMMUNITY ID:		198
RESPONDENT ID:		
INTERVIEWER:		
INTERVIEW DATE:		
START TIME:		
STOP TIME:		
	DATA CODED BY:	
	DATA ENTERED BY:	
	SUPERVISOR:	

COOPERATING ORGANIZATIONS

DEPARTMENT OF ANTHROPOLOGY
UNIVERSITY OF ALASKA FAIRBANKS
310 EIELSON BUILDING
FAIRBANKS, AK 99775

842-5257

DIVISION OF SUBSISTENCE
ALASKA DEPT OF FISH & GAME
333 RASPBERRY ROAD
ANCHORAGE, AK 99518

267-2807

HOUSEHOLD MEMBERS	HOUSEHOLD ID	

Between JANUARY and DECEMBER, 2011...

...who lived in your household?

ID#	IS THIS PERSON ANSWERING QUESTIONS *ON THIS SURVEY?* *(circle)*	MALE OR FEMALE? *(circle)*	ALASKA NATIVE? *(circle)*	IN WHAT YEAR WAS THIS PERSON BORN? *(year)*	HOW LONG HAS THIS PERSON LIVE IN Kokhanok *(years)*	IN 2011, DID THIS PERSON SUBSISTENCE FISH FOR SALMON? *(circle)*	IN 2011, DID THIS PERSON HELP PROCESS SALMON? *(circle)*
HEAD 1	Y N	M F	Y N		YRS	Y N	Y N
Enter spouse or partner next. If household has a SINGLE HEAD, leave HEAD 2 blank.							
HEAD 2	Y N	M F	Y N		YRS	Y N	Y N
Enter children (oldest to youngest), grandchildren, grandparents, brothers, sisters, or anyone else living full-time in this household.							
03	Y N	M F	Y N		YRS	Y N	Y N
04	Y N	M F	Y N		YRS	Y N	Y N
05	Y N	M F	Y N		YRS	Y N	Y N
06	Y N	M F	Y N		YRS	Y N	Y N
07	Y N	M F	Y N		YRS	Y N	Y N
08	Y N	M F	Y N		YRS	Y N	Y N
09	Y N	M F	Y N		YRS	Y N	Y N
10	Y N	M F	Y N		YRS	Y N	Y N
11	Y N	M F	Y N		YRS	Y N	Y N
12	Y N	M F	Y N		YRS	Y N	Y N

PERMANENT HH MEMBERS: 01	KOKHANOK: 198

FISHERY PARTICIPATION — HOUSEHOLD ID

SALMON

Do members of your household USUALLY fish for SALMON for subsistence? ..... Y N

Between JANUARY and DECEMBER, 2011...
...Did members of your household USE or TRY TO HARVEST salmon? ..... Y N

If YES to either question, continue this section. If NO go to PARTICIPATION questions below...

Last year, did your household get a subsistence salmon permit?	Y N
If YES ...how many members of your household were listed on the permit?	(#)
...were there other people outside of your household listed on the permit?	Y N
...if yes how many people besides those in your household were listed on the permit?	(#)
...did you share your net with another household?	Y N
... if yes how many other households?	(#)
If NO ...were you listed on another household's permit?	Y N
Permit Number	(#)
	(write permit number above)
Does your household own a net for harvesting salmon?	Y N
How long has your family used your current fishing location?	(#)
Does your household use the same location each year to harvest salmon?	Y N
If not why has this changed over time? _____	

PARTICIPATION IN FISHERIES AND COMMUNITY

Does your household own a boat?

What are the top 3 most important fish eaten in your household?
1 _____
2 _____
3 _____

Does a member of your household participate in the commercial fishery?

If yes ...which fish and area?	Species	Area
1 _____		
2 _____		
3 _____		

How much of your household income comes from commercial f 0% 1-25% 26-50% 50-75% 76-100%
1 2 3 4

Has a member of your household held a position on a local advisory council related to subsistence fisheries?	Y N
Has a member of your household held a position or actively participated in a local commercial fishing	Y N
Has a member of your household ever testified or participated in a Federal Subsistence or State Board of	Y N

In your opinion, what are the reasons you continue to live in Kokhanok?
List most important reason first.
1 _____
2 _____
3 _____

Do you plan on leaving in the future?

If so why? _____

Do you consider fishing to be important for the economy of Kokhanok? Y N

If so why? _____

SALMON HOUSEHOLD ID

If the household fished for salmon in 2011 fill out this page. Otherwise go to comment page.

Please estimate how many salmon ALL MEMBERS OF YOUR HOUSEHOLD HARVESTED for subsistence use this year, including with a rod and reel. INCLUDE salmon you gave away, ate fresh, fed to dogs, or lost to spoilage. If fishing with others, report ONLY YOUR SHARE of the catch.

	IN 2011 DID MEMBERS OF YOUR HH...		IN 2011, HOW MANY (_____) DID YOUR HOUSEHOLD HARVEST?			REMOVED FROM COMMERICAL HARVEST FOR HOME USE		IN 2011...	
	...USE _____?	...TRY TO HARVEST _____?	CAUGHT WITH GILL NET (set or drift)	CAUGHT BY SEINING	CAUGHT WITH ROD AND REEL		UNITS	...DID YOUR HH SHARE _____ WITH OTHERS?	...DID OTHERS SHARE _____ WITH YOUR HH?
	(circle)		*(number taken by each gear type)*			*(number)*	*(ind)*	*(circle)*	
SOCKEYE SALMON	Y N	Y N					IND	Y N	Y N
115000003									
SPAWNING SOCKEYE	Y N	Y N					IND	Y N	Y N
117050000									
COHO SALMON	Y N	Y N					IND	Y N	Y N
112000003									
CHUM SALMON	Y N	Y N					IND	Y N	Y N
111020003									
KING SALMON	Y N	Y N					IND	Y N	Y N
113000003									
PINK SALMON	Y N	Y N					IND	Y N	Y N
114000003									
UNKNOWN SALMON	Y N	Y N					IND	Y N	Y N
119000003									

These columns should include all the salmon harvested by members of this household in 2011.

Assessments: Salmon

Between January and December, 2011...

Did your household use LESS, the SAME, or MORE salmon than in recent years?..... X L S M

X = do not use

If LESS or MORE,...

WHY was your use different?..... _____ 1

_____ 2

Last year...

did your household GET ENOUGH salmon?..... Y N

If NO...

What KIND of salmon did you need?..... _____

How would you describe the impact to your household of not getting salmon last year?

minor? major? severe?

(1) (2) (3)

Did your household do anything DIFFERENTLY because you did not get ENOUGH salmon?..... Y N

If YES...

What did your household do differently?..... _____ 1

_____ 2

Between JANUARY and DECEMBER, 2011...

...WHERE did members of your household harvest salmon? *Mark all harvest locations on MAP*

COMMENTS	HOUSEHOLD ID

DO YOU HAVE ANY QUESTIONS, COMMENTS, OR CONCERNS ABOUT FISHERIES IN YOUR AREA?

INTERVIEW SUMMARY:

BE SURE TO FILL IN THE STOP TIME ON THE FIRST PAGE!!!!

COMMENTS: 30	KOKHANOK: 198

4	Mark a point for each use area and mark an * next to the code for actual resources harvested.
6	Mark a point for each use area and mark an * next to the code for actual resources harvested.
8	Mark a point for each use area and mark an * next to the code for actual resources harvested.
10	Mark a point for each harvest location and a polygon for hunting effort on map.
12	Mark a point for each harvest location on map.
14	Draw a line to represent the trap line or a polygon for hunting area. Write the resource name on the map.
15	Draw a polygon for harvest location areas for each of the following categories on map and mark the code: migratory waterfowl, upland birds, and eggs.

Appendix B

Key Respondent Interview Protocol

Name

Age

Occupation

Years in X

Commercials Fisher: # Years

Location/Species:

Subsistence Fisher: # Years

Location/Species

Valuation of the resource

- How would you classify the importance of fish in your household?
    - Economic importance
    - Cultural importance
    - Dietary importance

Resource Change:

- Do you feel the *resource* has changed ecologically over your lifetime?
- How would you describe this change?
- Has your access to the resource been altered due to these changes?
- Do you continue to use the same areas as you once did? If not have they changed in terms of scale, they shrunk or got bigger, or just in terms of location?

Regulations and Politics:

- How have you been involved in regulatory changes?
- Are you involved in fish and game advisory committees?
- Do you hold, or have you held any positions in local/tribal governments?
- If yes do other members of your family hold positions or have they held positions?
- Do you think the local government is effective in assisting your community maintain their ability to fish both in terms of the commercial fishery and subsistence fishery?

Community and Commercial Fishing

- Has there been a change in the number of individuals participating in the subsistence and/or commercial fisheries in your community?
- Has there been a decline in the number of boats in the commercial fishery?
- How long have you participated in the fishery? How about your family?
- Is commercial fishing one of your sources of income? Do you, or others in your household have sources of income outside of commercial fishing?
- If you did fish and left the fishery why was this?

If commercial fishing continue:

- If there has been a decline in the fishery what do you attribute to the decline?
- If you are a commercial fisher, do you enjoy your job? Do you feel if you stopped commercial fishing that you would find other opportunities for income within your community? Please explain.
- If you ever wanted out of the commercial fishery do you feel it would be possible to sell your permit/quota and/or vessel?

SUBSISTENCE FISHERIES

- What subsistence resources do you utilize in terms of subsistence fishing?
- When did you learn how to subsistence fish? Who taught you?
- How many people in your family participate in the subsistence fishery?
- Do you own subsistence fishing gear? Do you own a boat that you use for subsistence? If not, do you use community gear?
- Do you think fishing for subsistence is important to meet the needs of your household in terms of food?
- Do you think continuing to subsistence fish is important for other reasons besides food? Elaborate.

COMMUNITY

- What future do you see for this community? Is fishing a part of that future?
- Do you think that commercial fishing continues to be a large part of the life here in this community?
- How about subsistence fishing?
- What is the reason for continuing to live in the community?
- Do you ever feel you want to leave the community?
- Is this a fishing community, and what I mean by that is fishing is the livelihood in terms of jobs and subsistence?